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- GRAY SCALE DOCUMENTS

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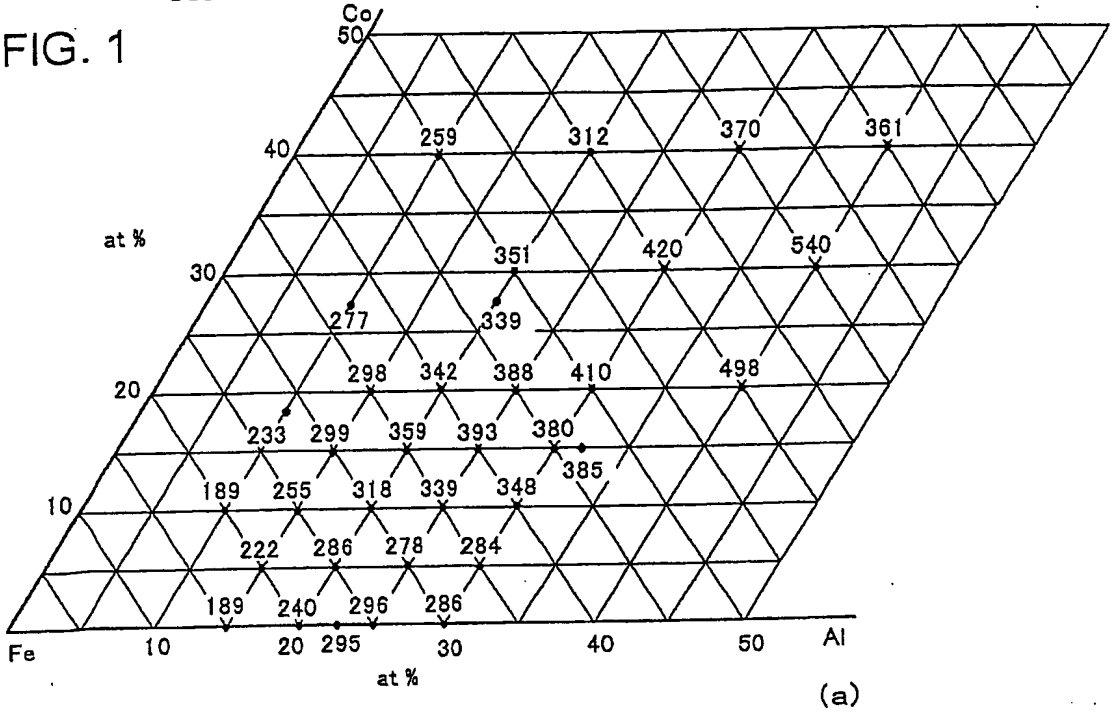
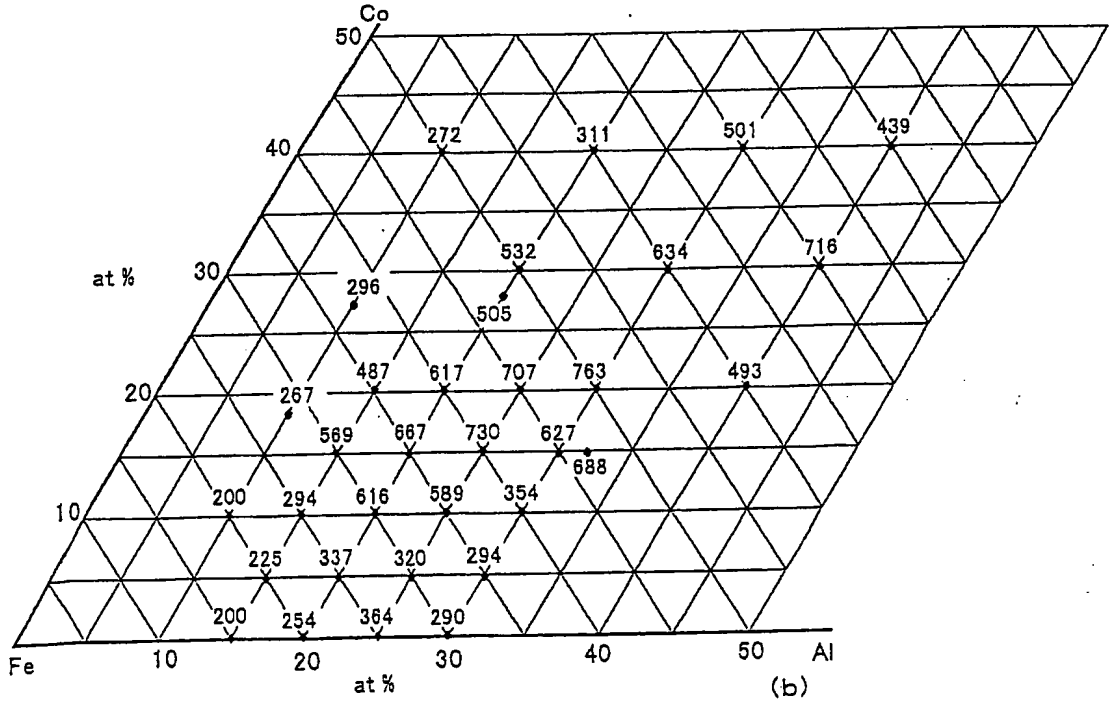
FIG. 1

HARDNESS DISTRIBUTION WHEN Fe-Al-Co TERNARY ALLOYS ARE SUBJECTED TO RAPID COOLING AFTER HEATING AT 1,200 °C



(a)

HARDNESS DISTRIBUTION WHEN 10-HOUR AGING IS DONE AT 600 °C



(b)

FIG. 2

EFFECT OF ADDITION OF Co UPON HARDNESS OF Fe-Al ALLOYS

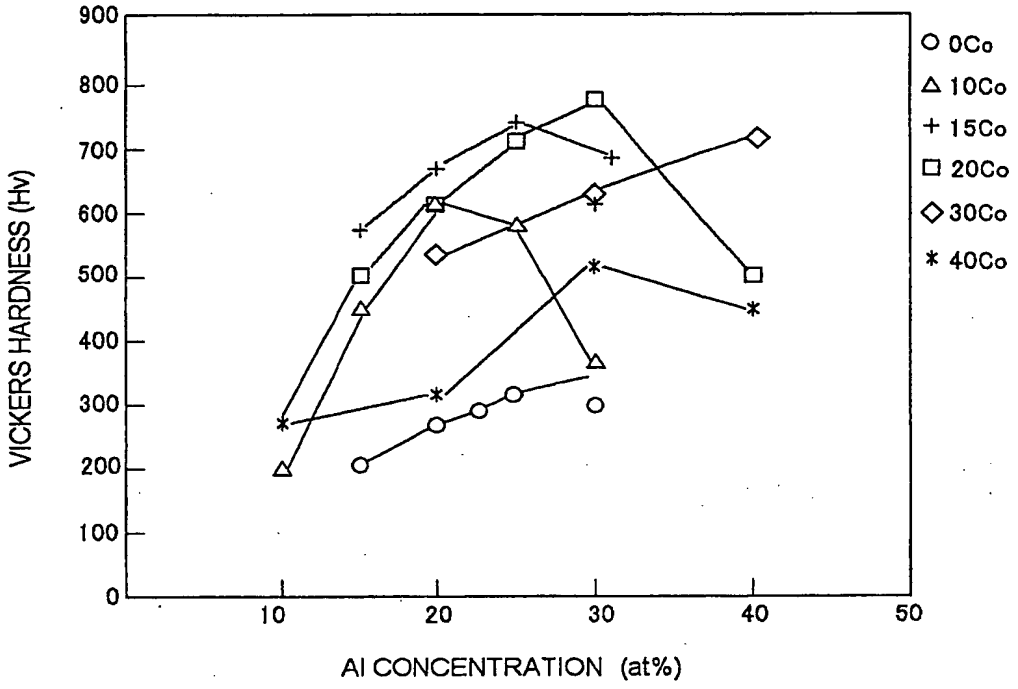


FIG. 3

CURIE TEMPERATURE OF Fe-Al-10AT% Co ALLOYS

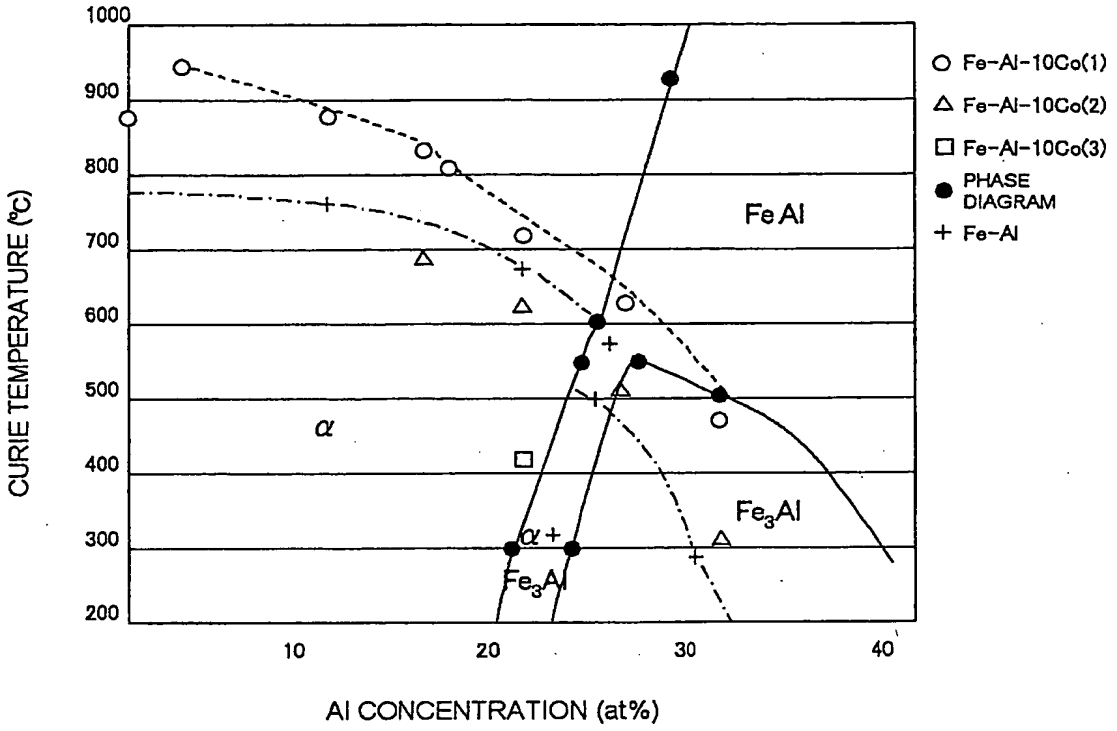
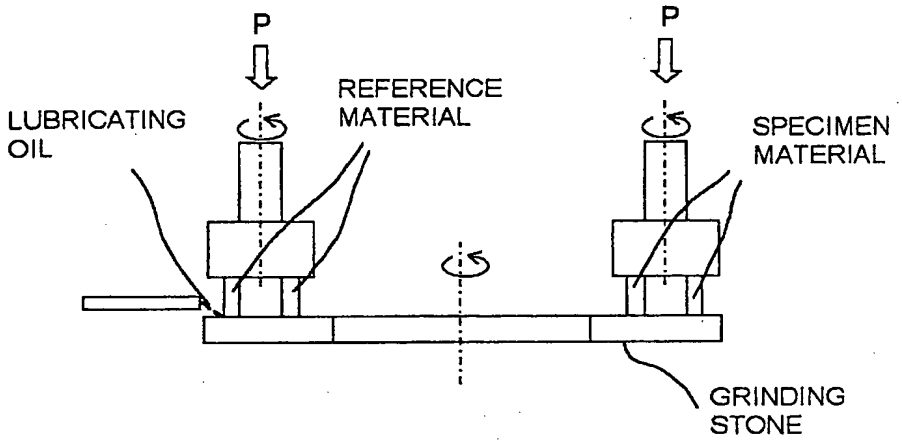


FIG. 4



LOAD : 100kg
ROTATIONAL SPEED OF GRINDING STONE : 60rpm
ROTATIONAL SPEED OF SPECIMEN : 10rpm
LUBRICATING OIL : #30 OIL
AMOUNT OF LUBRICATING OIL : 5cc/min
REFERENCE MATERIAL: S45C QUENCHED AND TEMPERED MATERIAL (Hv=500)

FIG. 5

HARDNESS OF Fe BASE ORDERED PHASE MATERIALS VERSUS THEIR ABRASION RATIOS

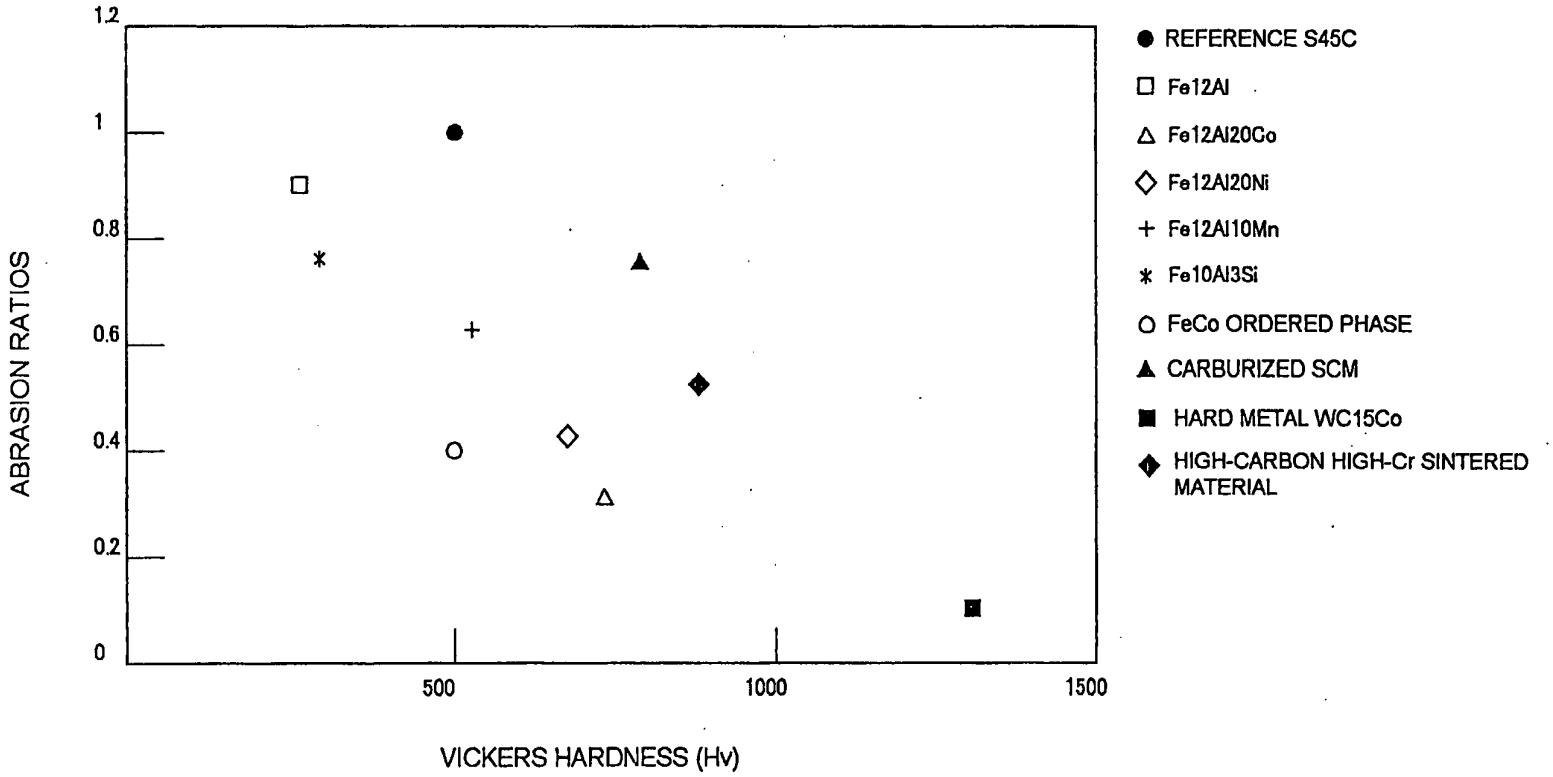


FIG. 6

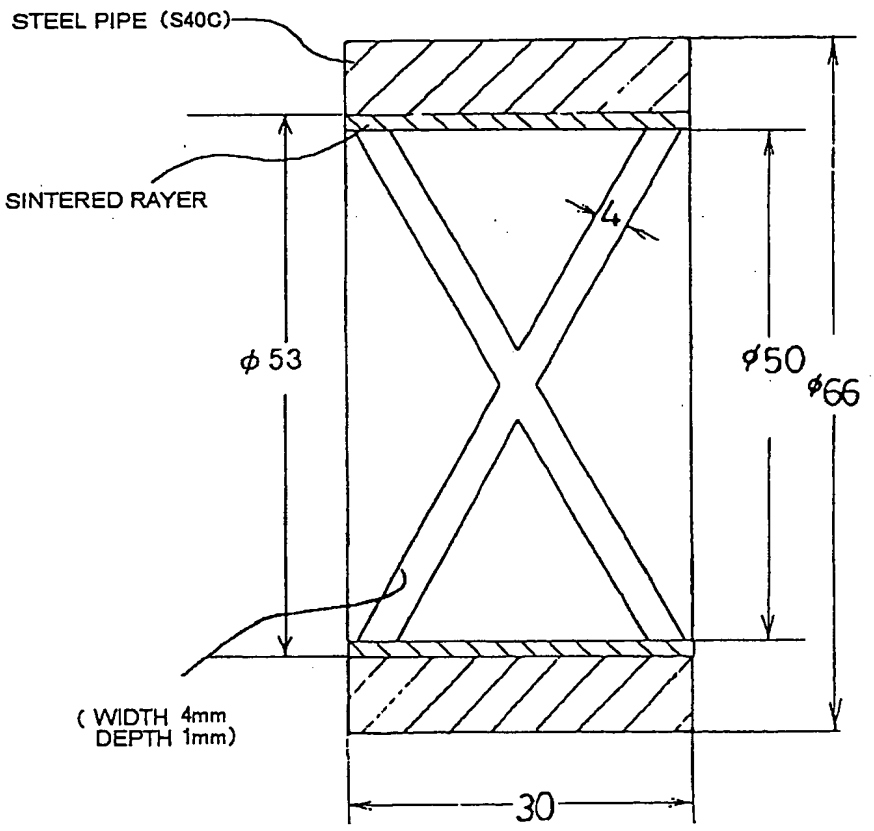
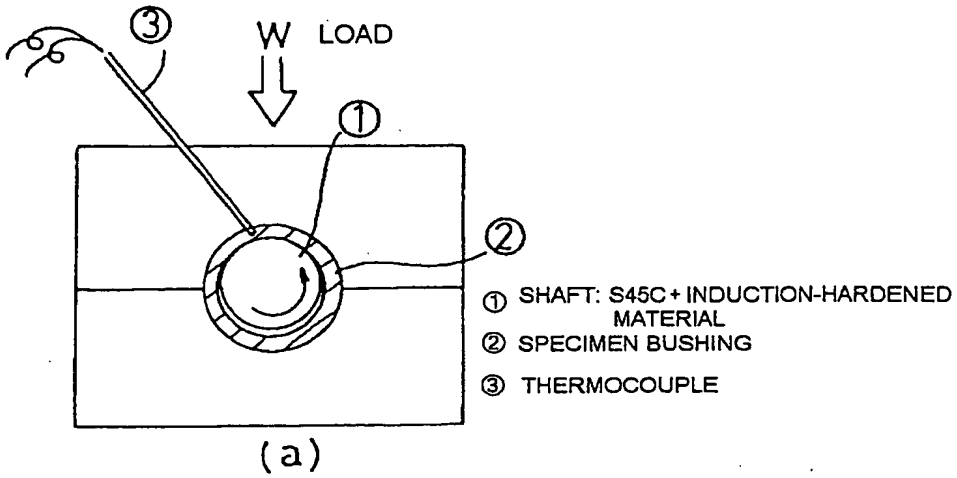
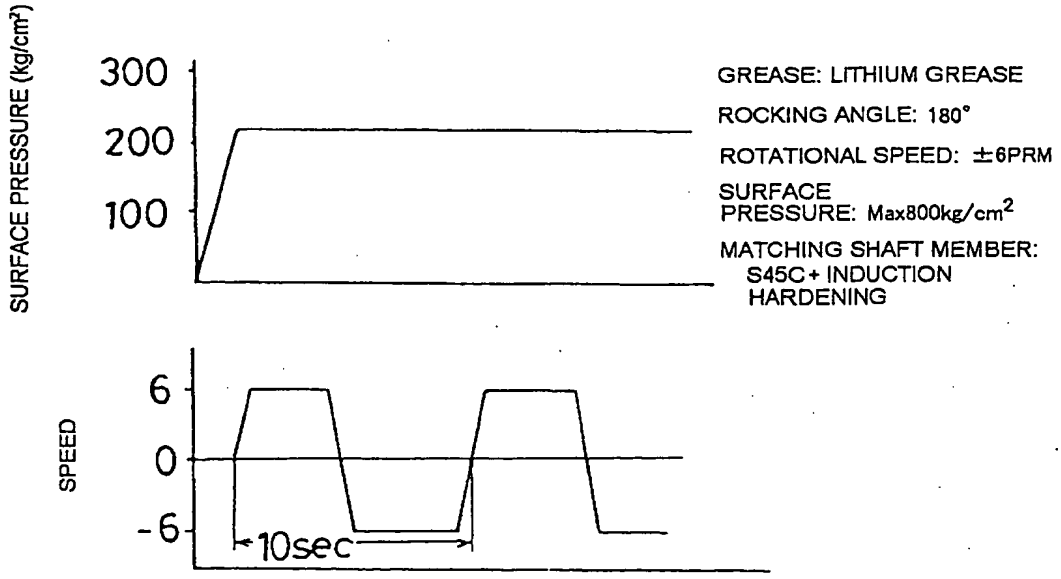

STEEL PIPE (S40C)
SINTERED RAYER
4
φ53
φ50
φ66
(WIDTH 4mm
DEPTH 1mm)
30

FIG. 7


③
W LOAD
①
②
① SHAFT: S45C + INDUCTION-HARDENED MATERIAL
② SPECIMEN BUSHING
③ THERMOCOUPLE

(a)


SURFACE PRESSURE (kg/cm²)
300
200
100
GREASE: LITHIUM GREASE
ROCKING ANGLE: 180°
ROTATIONAL SPEED: ±6PRM
SURFACE PRESSURE: Max800kg/cm²
MATCHING SHAFT MEMBER: S45C + INDUCTION HARDENING
SPEED
6
0
-6
10sec

(b)

FIG. 8

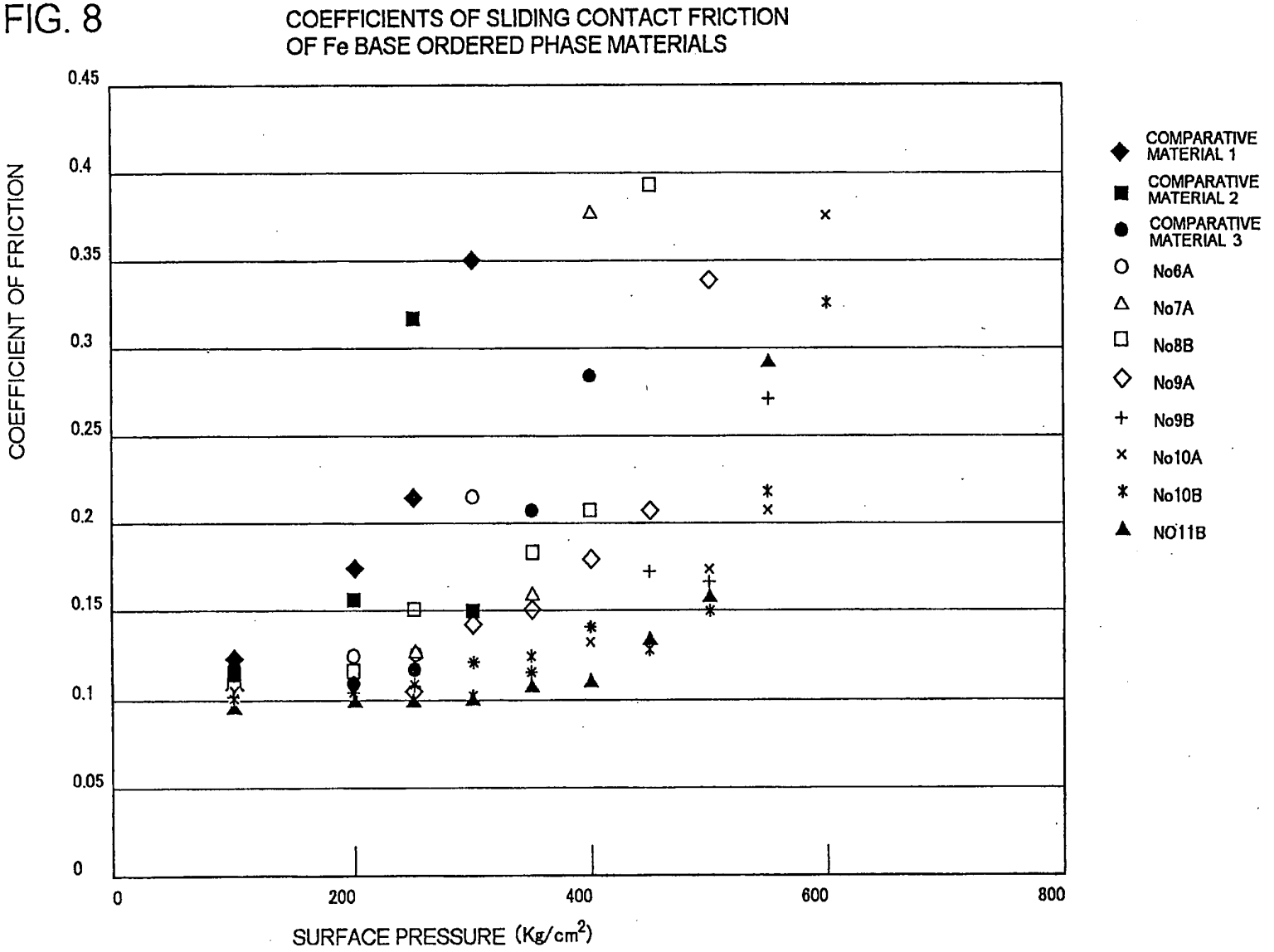

COEFFICIENTS OF SLIDING CONTACT FRICTION
OF Fe BASE ORDERED PHASE MATERIALS
COEFFICIENT OF FRICTION
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
200
400
600
800
SURFACE PRESSURE (Kg/cm2)
COMPARATIVE MATERIAL 1
COMPARATIVE MATERIAL 2
COMPARATIVE MATERIAL 3
No6A
No7A
No8B
No9A
No9B
No10A
No10B
NO11B

FIG. 9

SLIDING ABRASION AMOUNTS OF Fe BASE ORDERED PHASE MATERIALS

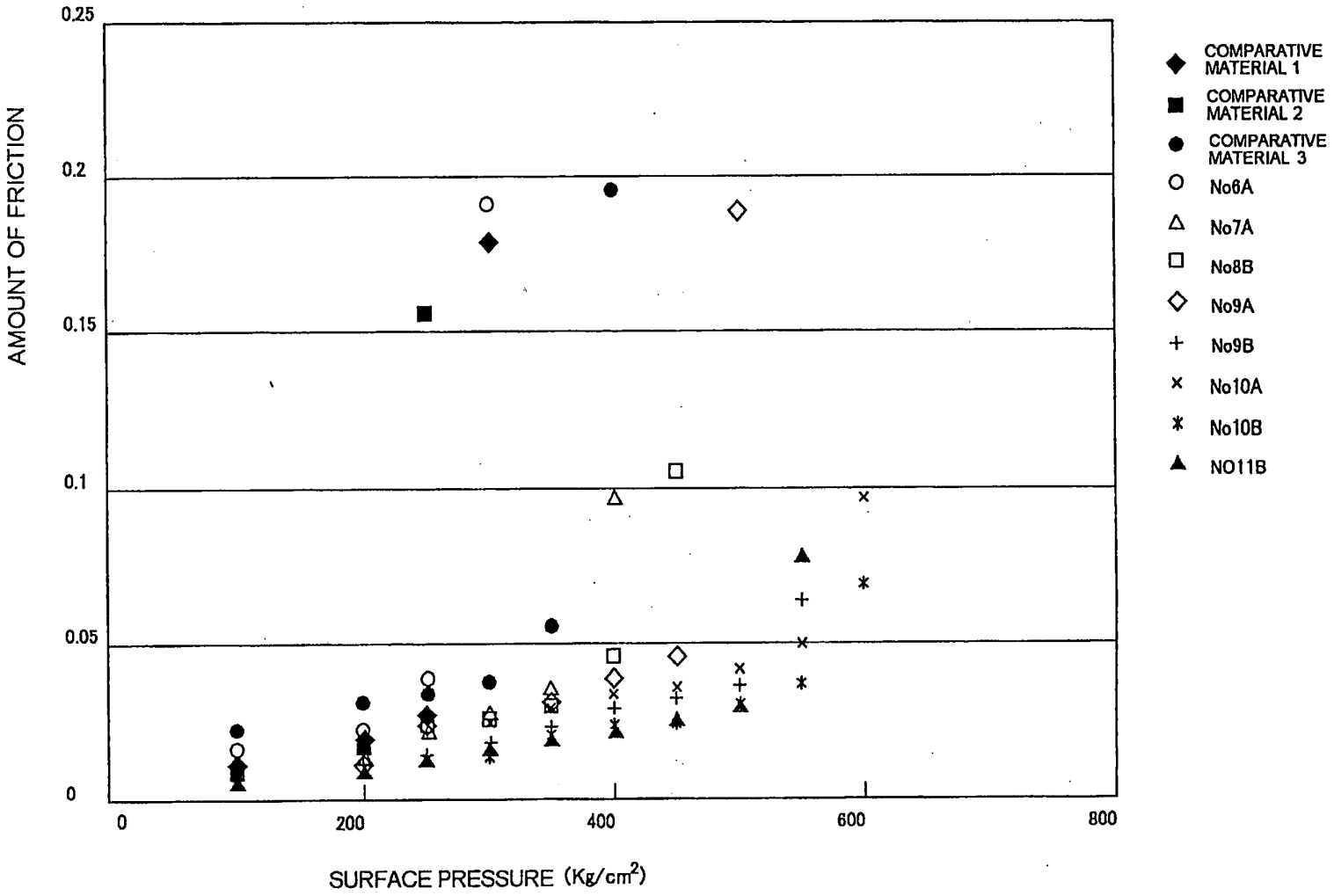


FIG. 10

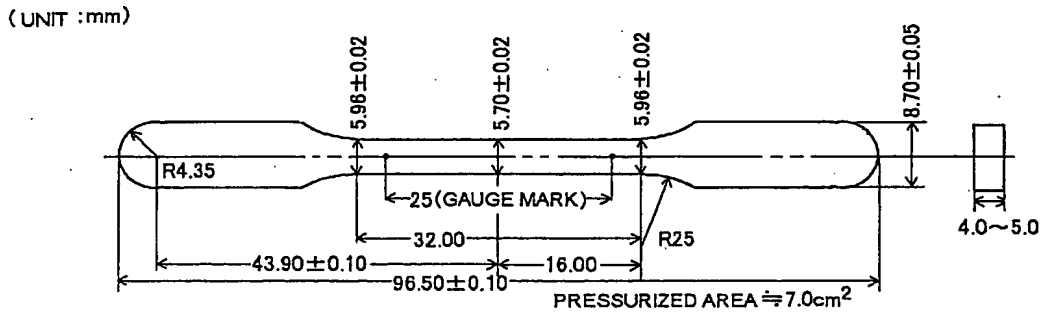

(UNIT :mm)
5.96±0.02
5.70±0.02
5.96±0.02
8.70±0.05
R4.35
25(GAUGE MARK)
32.00
R25
43.90±0.10
16.00
96.50±0.10
PRESSURIZED AREA ≒7.0cm2
4.0~5.0

FIG. 11

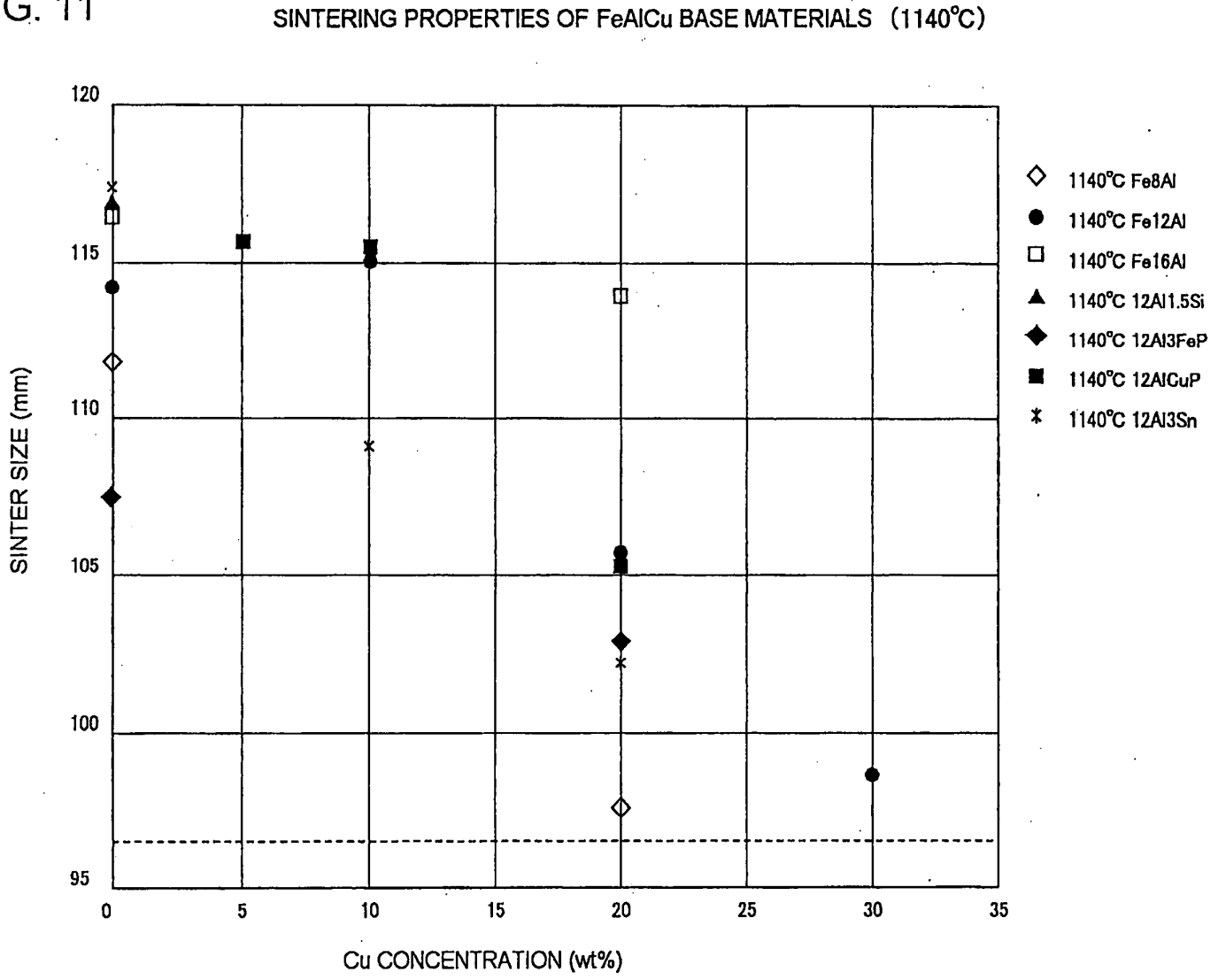

SINTERING PROPERTIES OF FeAlCu BASE MATERIALS (1140°C)
SINTER SIZE (mm)
120
115
110
105
100
95
0
5
10
15
20
25
30
35
Cu CONCENTRATION (wt%)
1140°C Fe8Al
1140°C Fe12Al
1140°C Fe16Al
1140°C 12Al1.5Si
1140°C 12Al3FeP
1140°C 12AlCuP
1140°C 12Al3Sn

FIG. 12

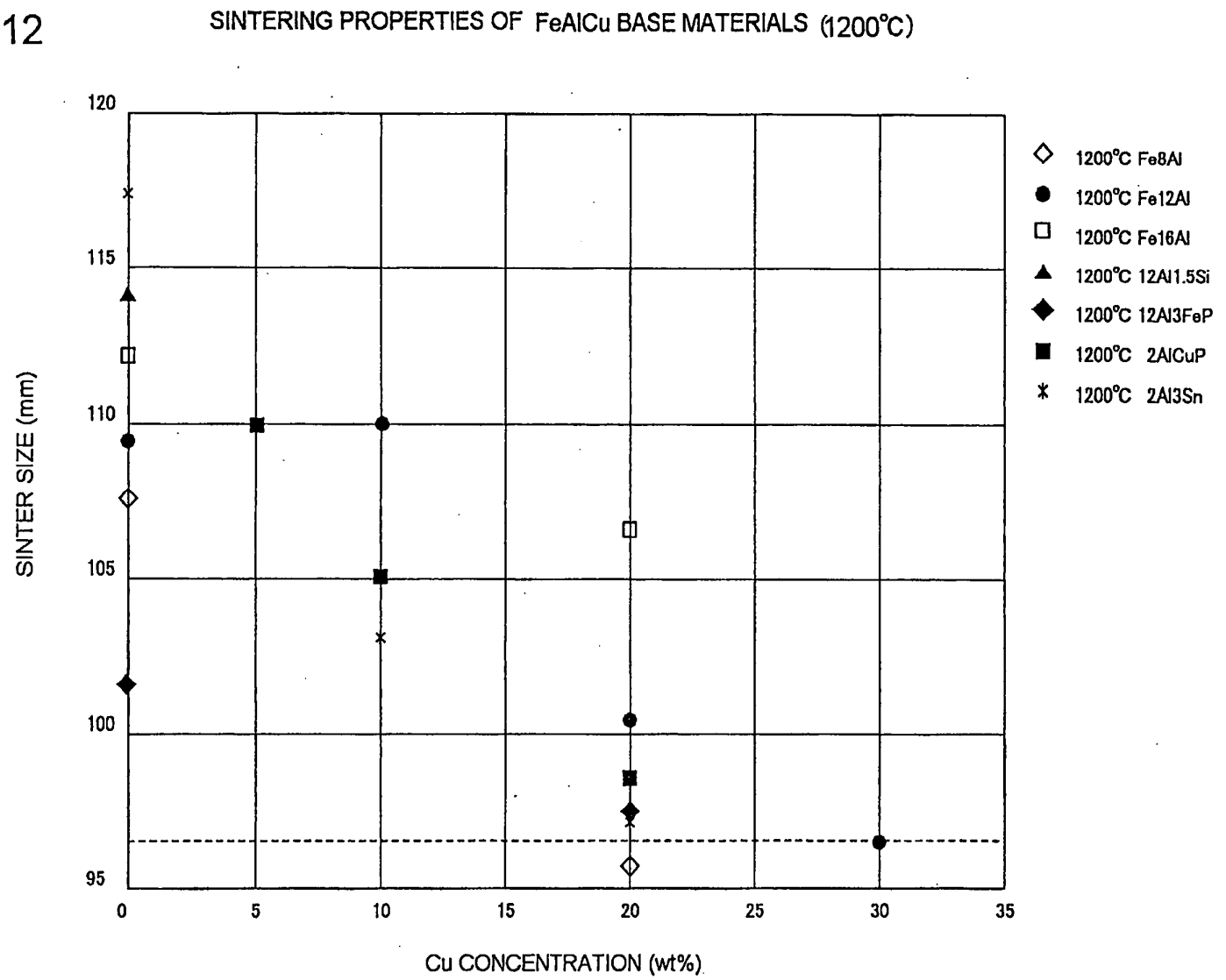

SINTERING PROPERTIES OF FeAlCu BASE MATERIALS (1200℃)
SINTER SIZE (mm)
120
115
110
105
100
95
0
5
10
15
20
25
30
35
Cu CONCENTRATION (wt%)
1200℃ Fe8Al
1200℃ Fe12Al
1200℃ Fe16Al
1200℃ 12Al1.5Si
1200℃ 12Al3FeP
1200℃ 2AlCuP
1200℃ 2Al3Sn

FIG. 13

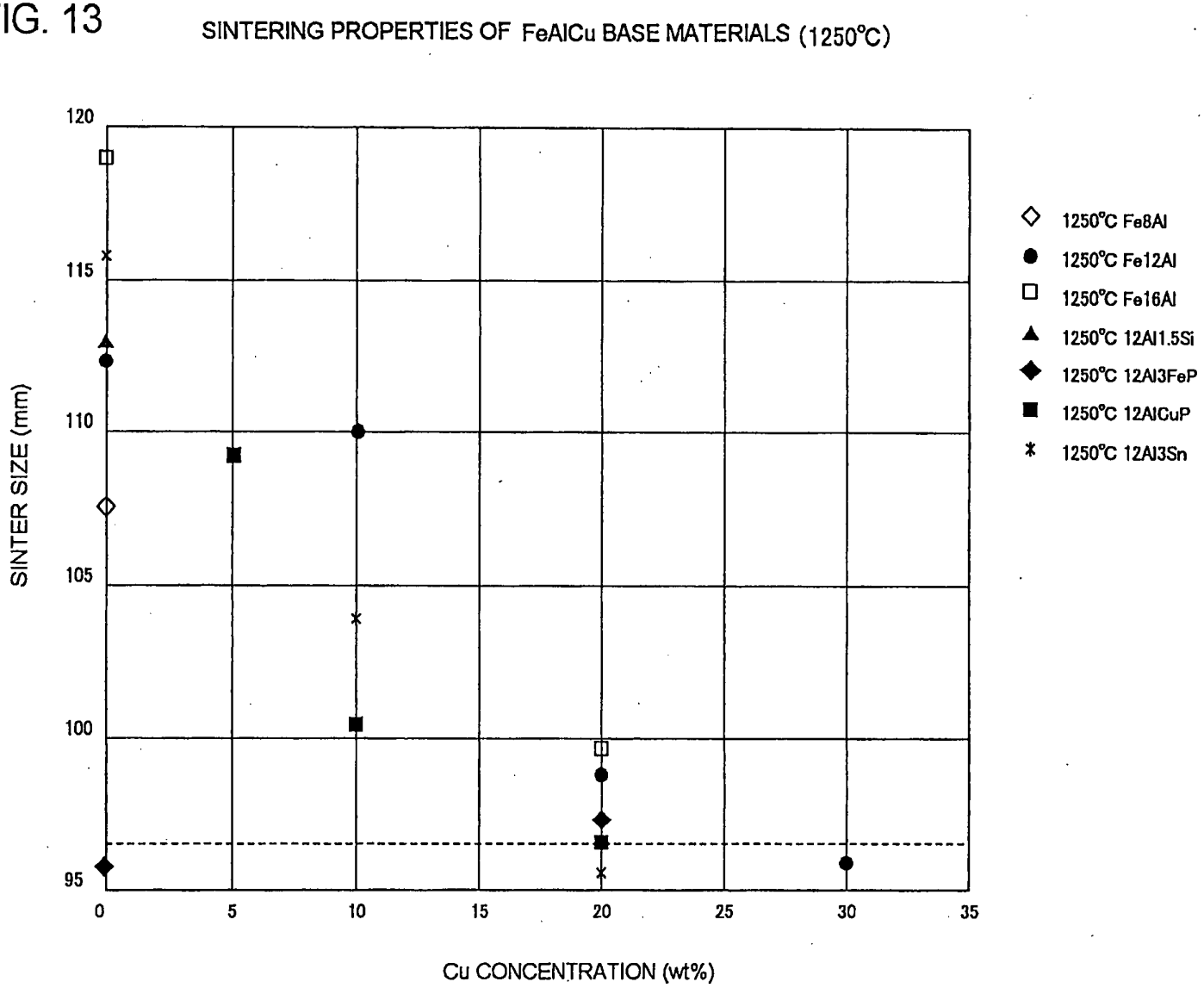
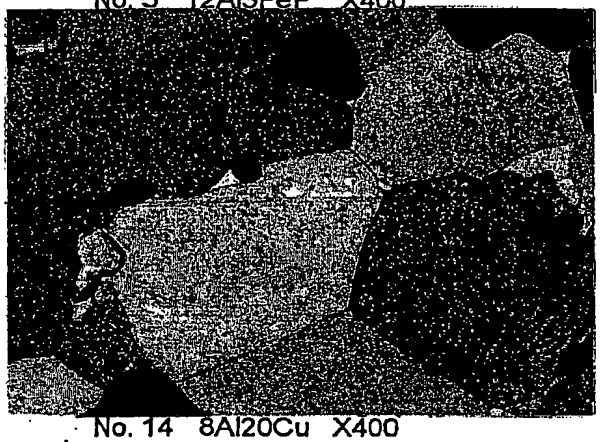

SINTERING PROPERTIES OF FeAlCu BASE MATERIALS (1250°C)
SINTER SIZE (mm)
120
115
110
105
100
95
0
5
10
15
20
25
30
35
Cu CONCENTRATION (wt%)
1250°C Fe8Al
1250°C Fe12Al
1250°C Fe16Al
1250°C 12Al1.5Si
1250°C 12Al3FeP
1250°C 12AlCuP
1250°C 12Al3Sn

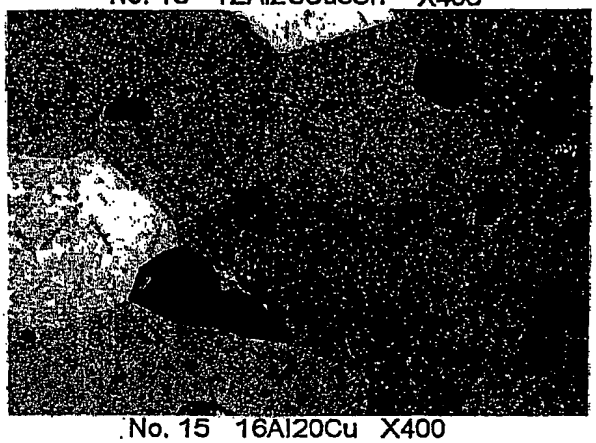
FIG. 14 SINTERED STRUCTURES OF VARIOUS Fe ORDERED PHASE SINTERED ALLOYS

No. 5 12Al3FeP X400

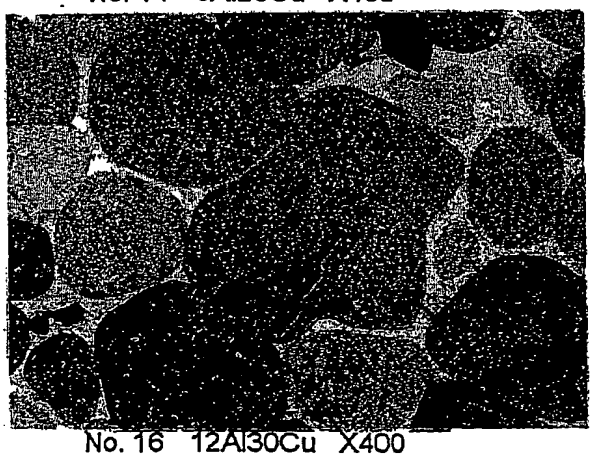
No. 13 12Al20Cu3Sn X400



No. 14 8Al20Cu X400



No. 15 16Al20Cu X400



No. 16 12Al30Cu X400

FIG. 15 EFFECTS OF Si, Ni, Co, FeAl ALLOYS UPON SINTER-CONTRACTIBILITY

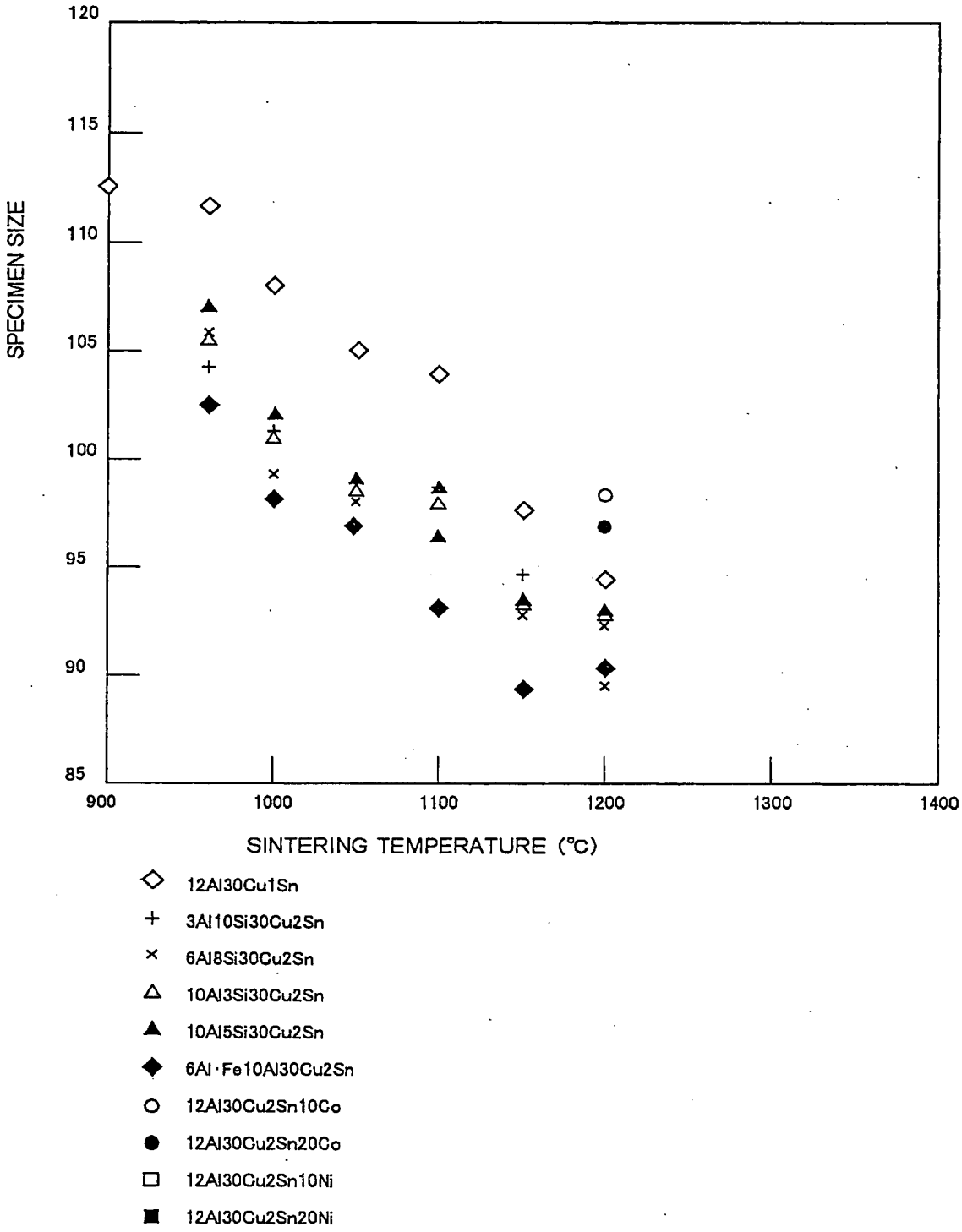
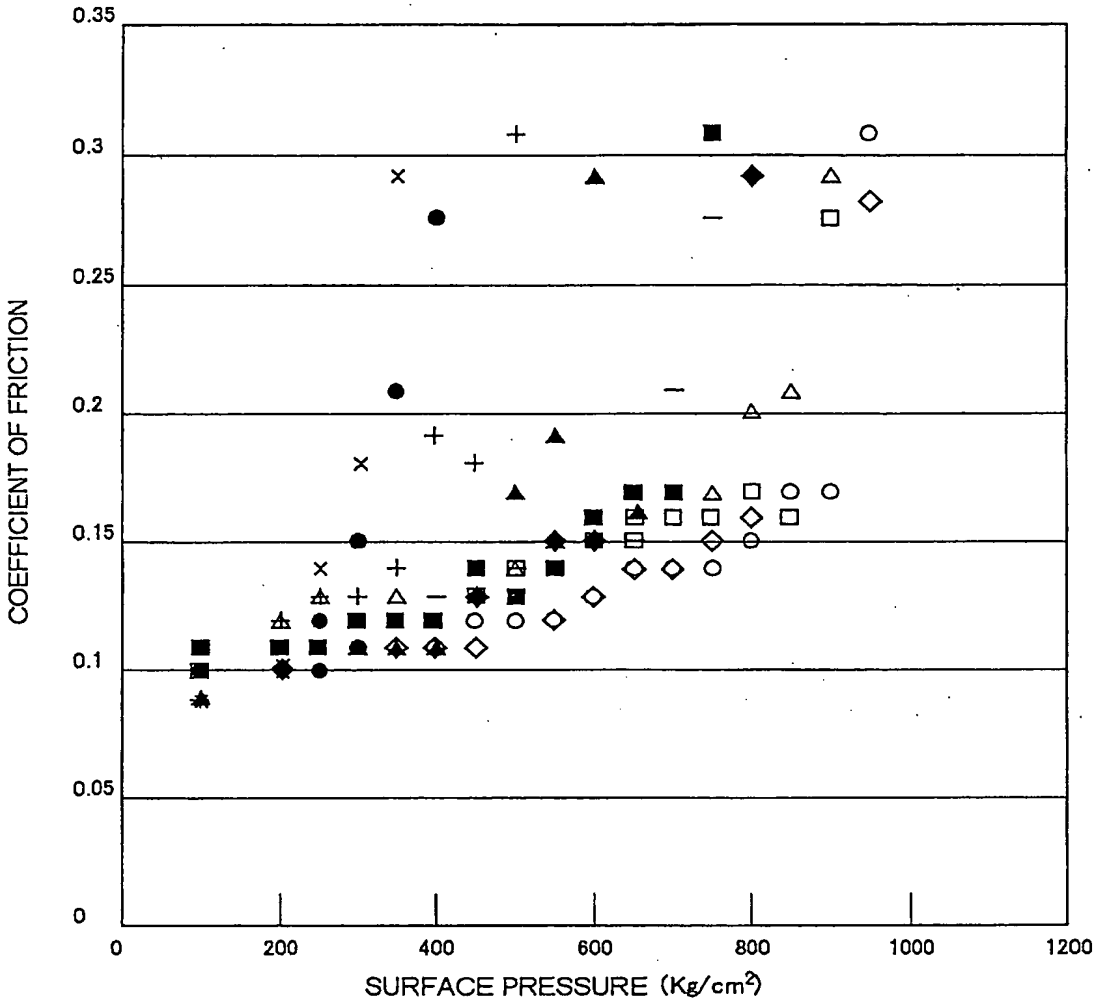


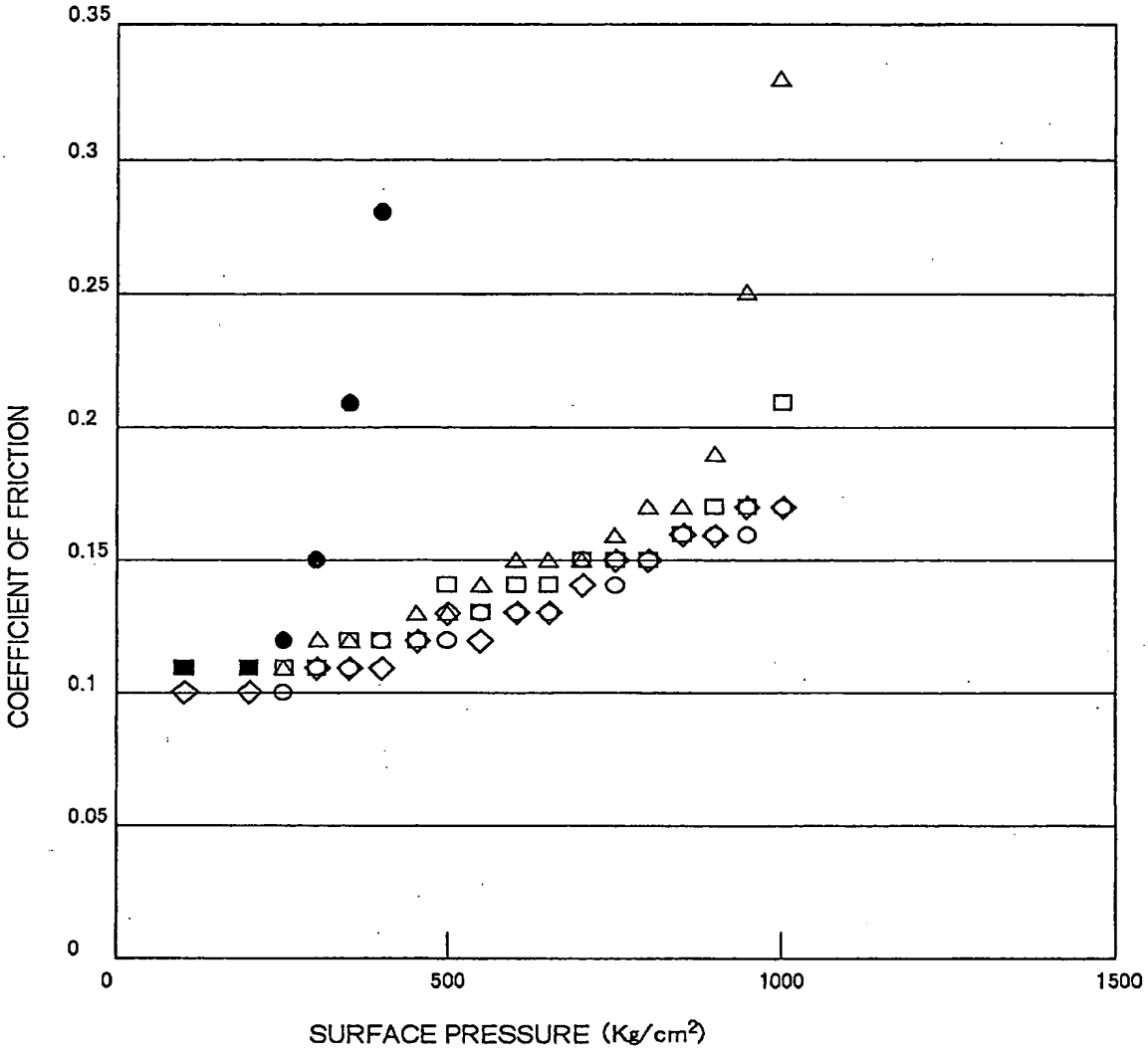
FIG. 16

SEIZURE RESISTANCE OF Fe BASE ORDERED PHASE SINTERED ALLOYS (POROSITY = ABOUT 10% VOLUME)



- ● HIGH STRENGTH BRASS QUARTERNARY MATERIAL: COMPARATIVE MATERIAL 3
- △ No5 12Al3FeP
- □ No20 12Al30Cu
- ◇ No29 12Al30Cu10Co
- ○ No31 12Al30Cu10Ni
- × No43 5FeAl
- \+ No44 10FeAl
- — No45 20FeAl
- ■ No46 30FeAl
- ▲ No47 10FeAlCo
- ◆ No48 20FeAlCo

FIG. 17 SEIZURE RESISTANCE OF Fe BASE ORDERED PHASE SINTERED ALLOYS (POROSITY = ABOUT 20% VOLUME)



● HIGH STRENGTH BRASS QUARTERNARY MATERIAL: COMPARATIVE MATERIAL 3

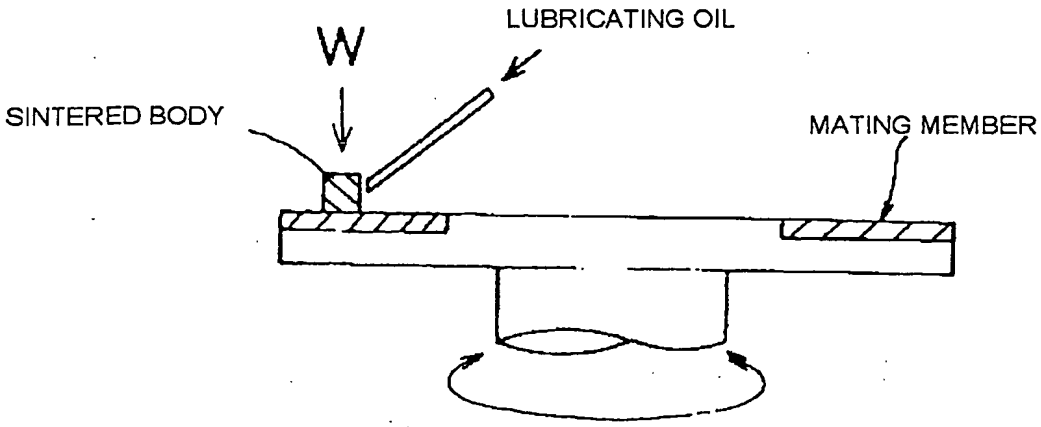
△ No5 12Al3FeP

□ No20 12Al30Cu

◇ No29 12Al30Cu10Co

○ No31 12Al30Cu10Ni

FIG. 18



TEST CONDITIONS

MATING MEMBER: CARBURIZED AND QUENCHED SCM 420

SURFACE HARDNESS: H_{RC} 60～62

SURFACE COARSENESS: 2.55 OR LESS

LUBRICATING OIL: E001, AMOUNT OF OIL: 250cm^3/min.

OIL TEMPERATURE: 60℃

CIRCUMEFERENTIAL SPEED: 10m/sec.

SURFACE PRESSURE: max 800kg/cm^2

(50kg/cm^2 for each time)

FIG. 19

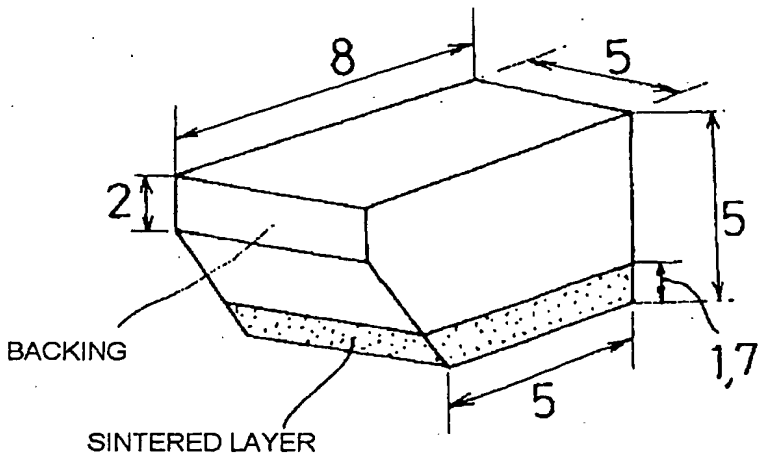


FIG. 20

SLIDING PROPERTIES OF Fe BASE SINTERED MATERIALS

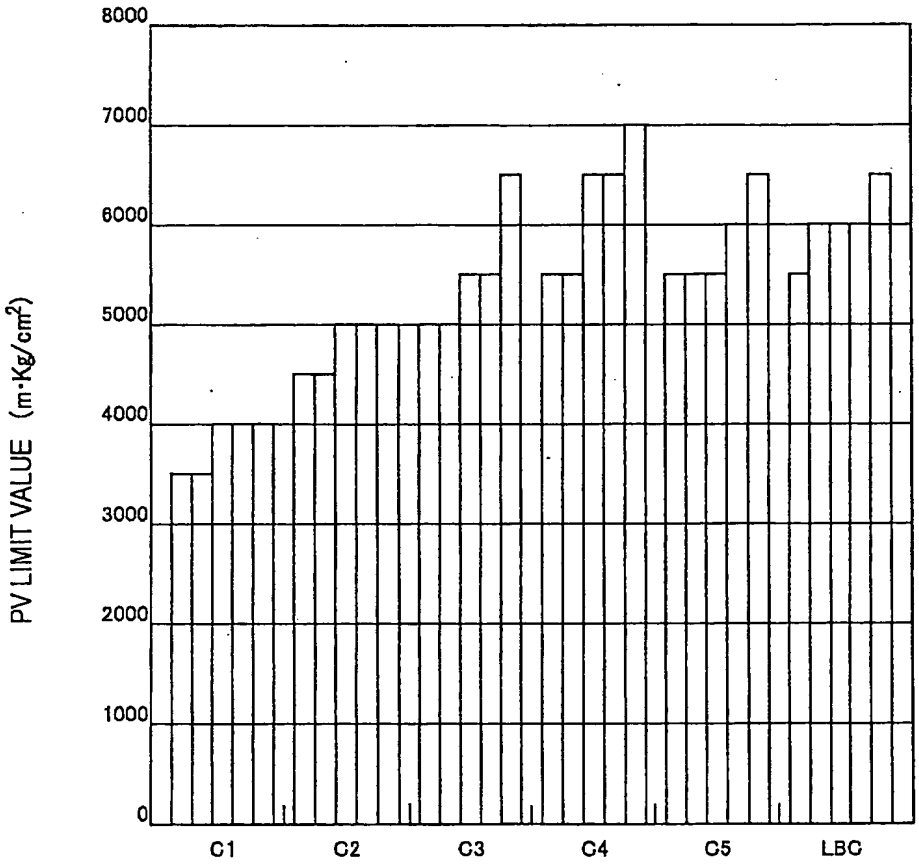
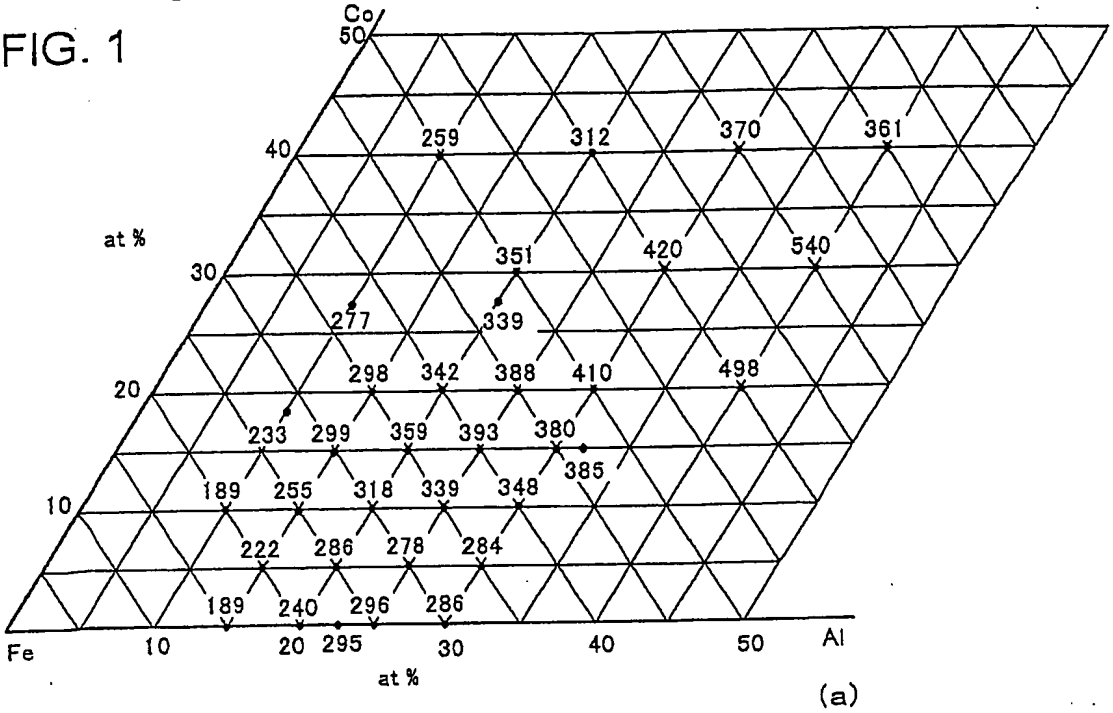


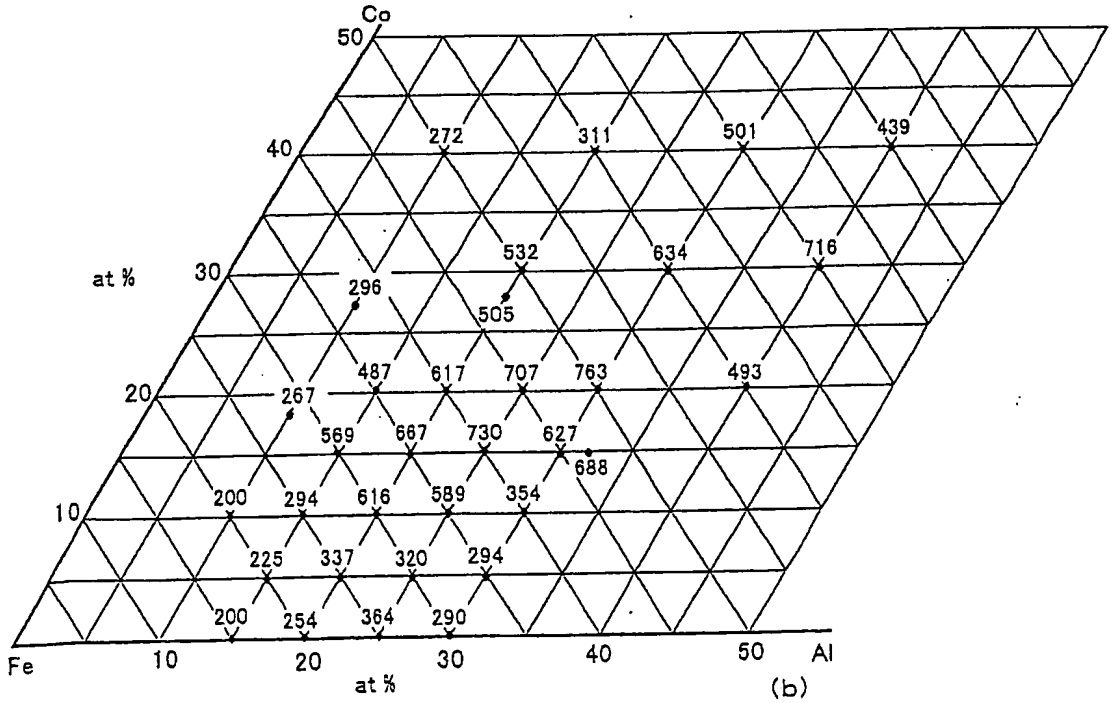
FIG. 1

HARDNESS DISTRIBUTION WHEN Fe-Al-Co TERNARY ALLOYS ARE SUBJECTED TO RAPID COOLING AFTER HEATING AT 1,200 °C



(a)

HARDNESS DISTRIBUTION WHEN 10-HOUR AGING IS DONE AT 600 °C



(b)

FIG. 2

EFFECT OF ADDITION OF Co UPON HARDNESS OF Fe-Al ALLOYS

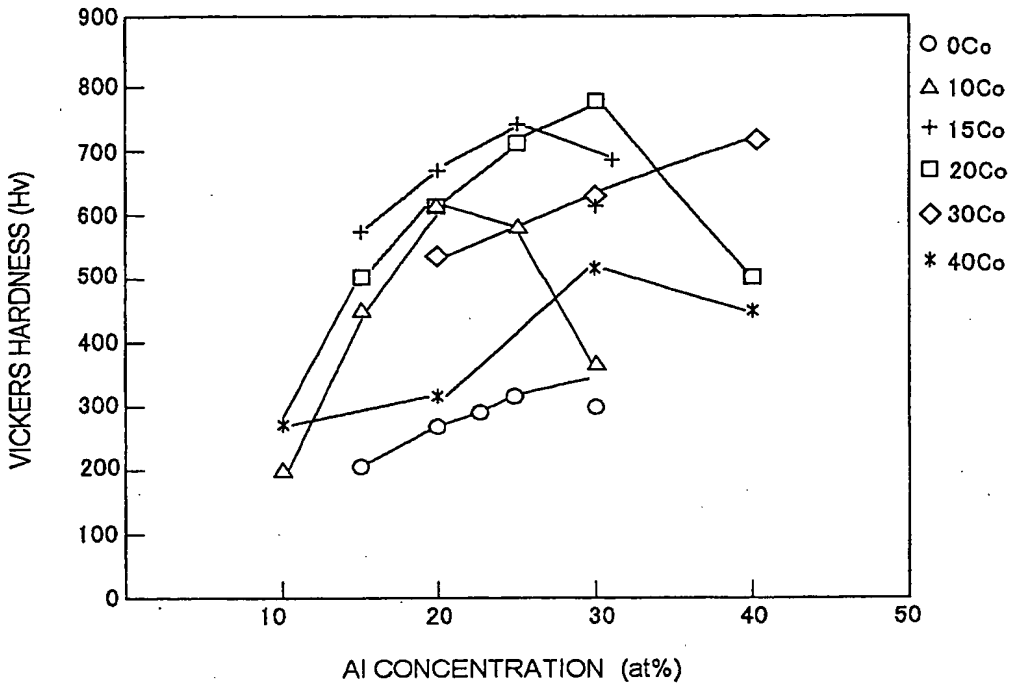


FIG. 3

CURIE TEMPERATURE OF Fe-Al-10AT% Co ALLOYS

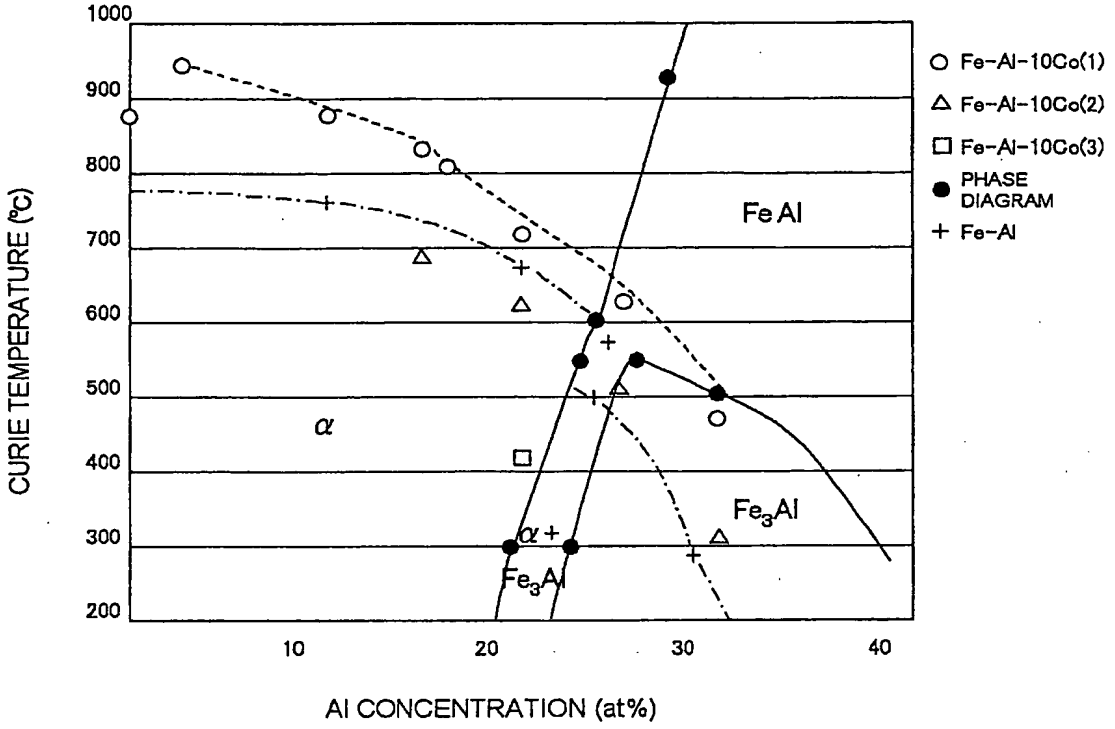
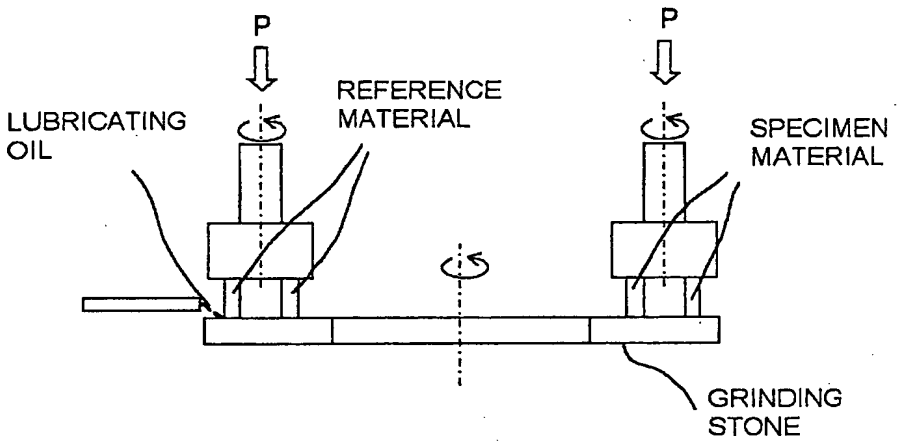


FIG. 4



LOAD : 100kg
ROTATIONAL SPEED OF GRINDING STONE : 60rpm
ROTATIONAL SPEED OF SPECIMEN : 10rpm
LUBRICATING OIL : #30 OIL
AMOUNT OF LUBRICATING OIL : 5cc/min
REFERENCE MATERIAL: S45C QUENCHED AND TEMPERED MATERIAL (Hv=500)

FIG. 5 HARDNESS OF Fe BASE ORDERED PHASE MATERIALS VERSUS THEIR ABRASION RATIOS

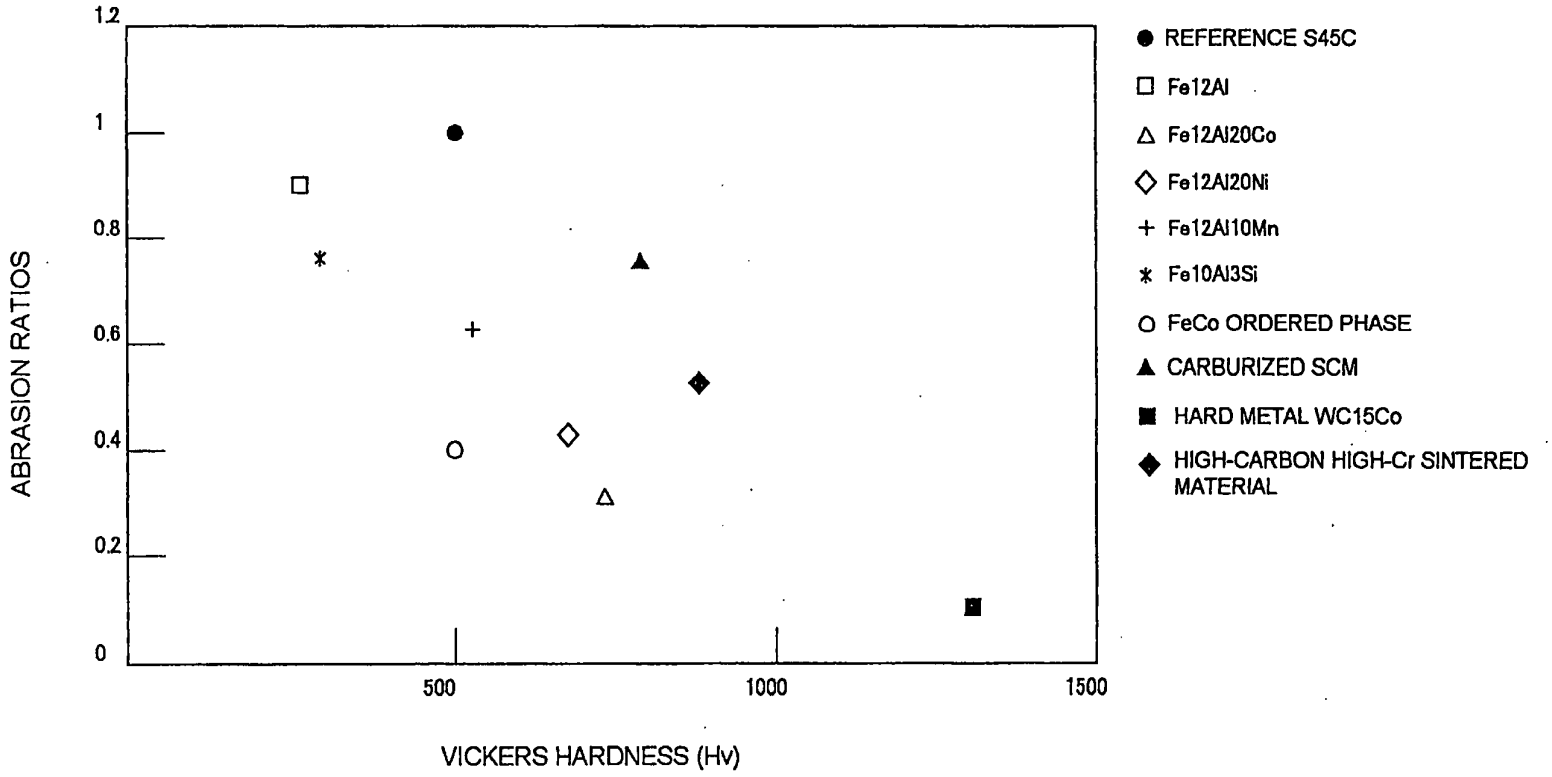


FIG. 6

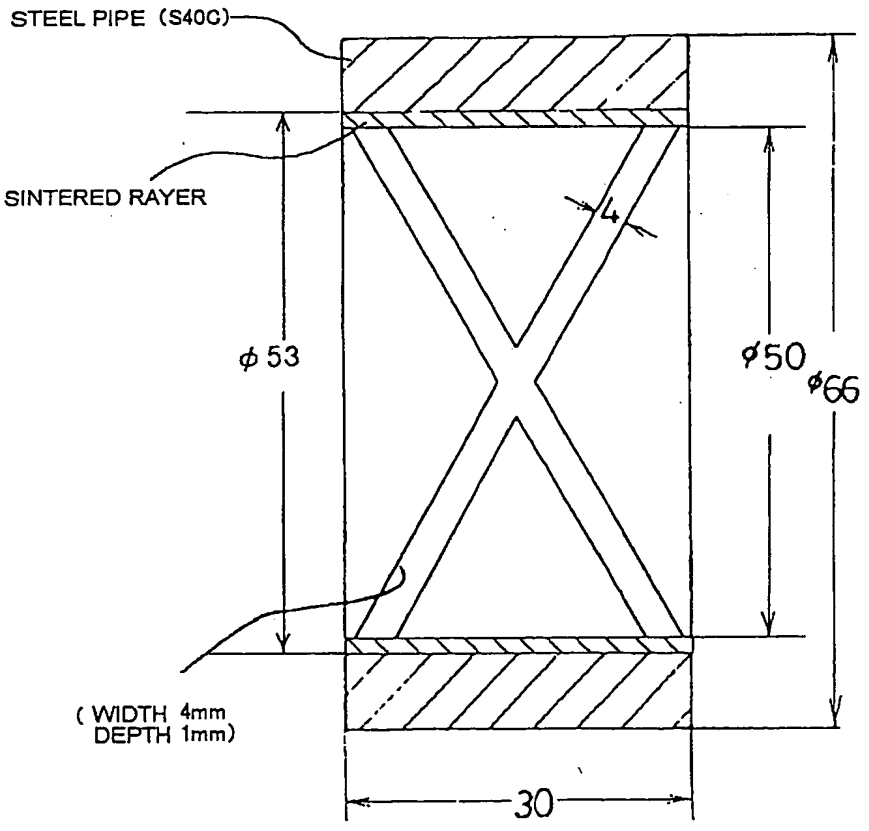
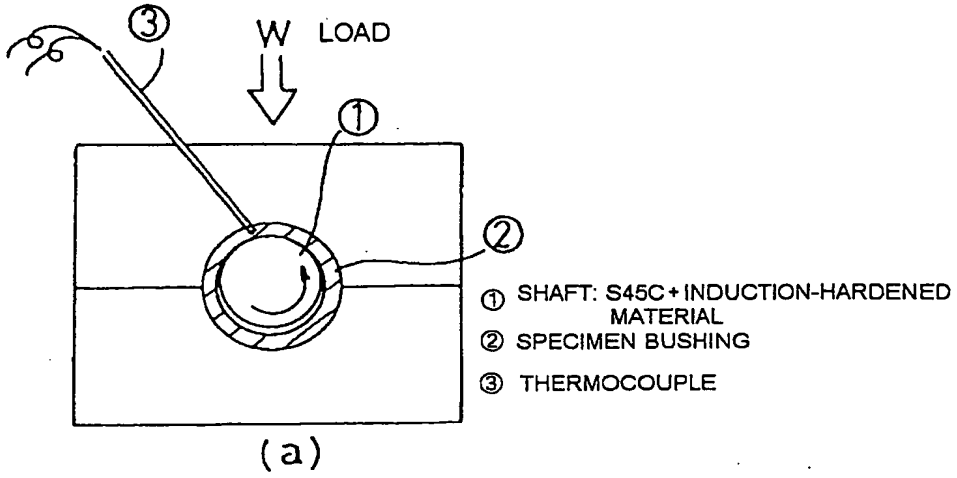
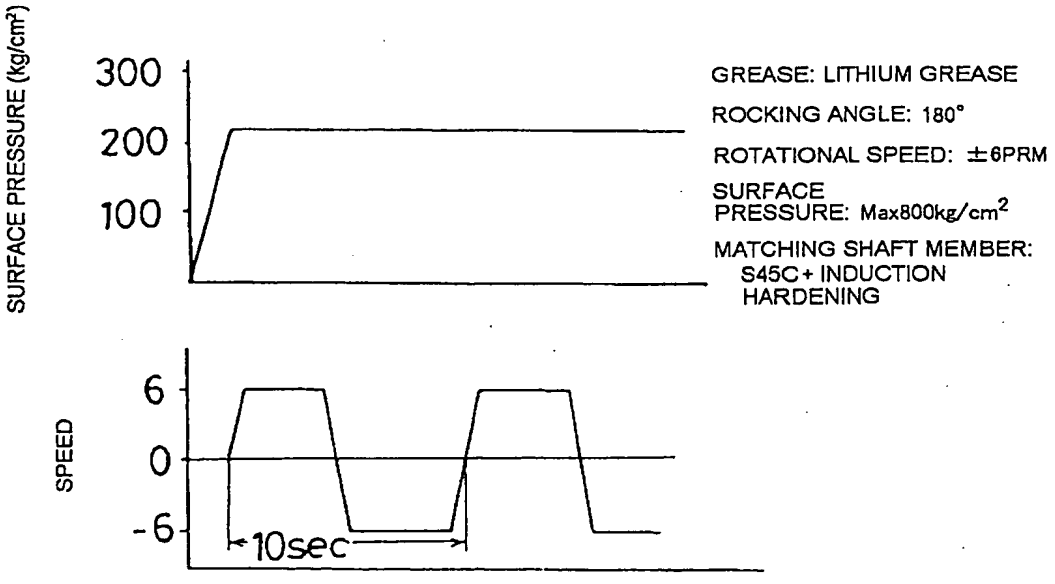

STEEL PIPE (S40C)
SINTERED RAYER
4
φ53
φ50
φ66
(WIDTH 4mm
DEPTH 1mm)
30

FIG. 7


③
W LOAD
①
②
① SHAFT: S45C + INDUCTION-HARDENED MATERIAL
② SPECIMEN BUSHING
③ THERMOCOUPLE

(a)


SURFACE PRESSURE (kg/cm²)
300
200
100
GREASE: LITHIUM GREASE
ROCKING ANGLE: 180°
ROTATIONAL SPEED: ±6PRM
SURFACE PRESSURE: Max800kg/cm²
MATCHING SHAFT MEMBER: S45C + INDUCTION HARDENING
SPEED
6
0
-6
10sec

(b)

FIG. 8

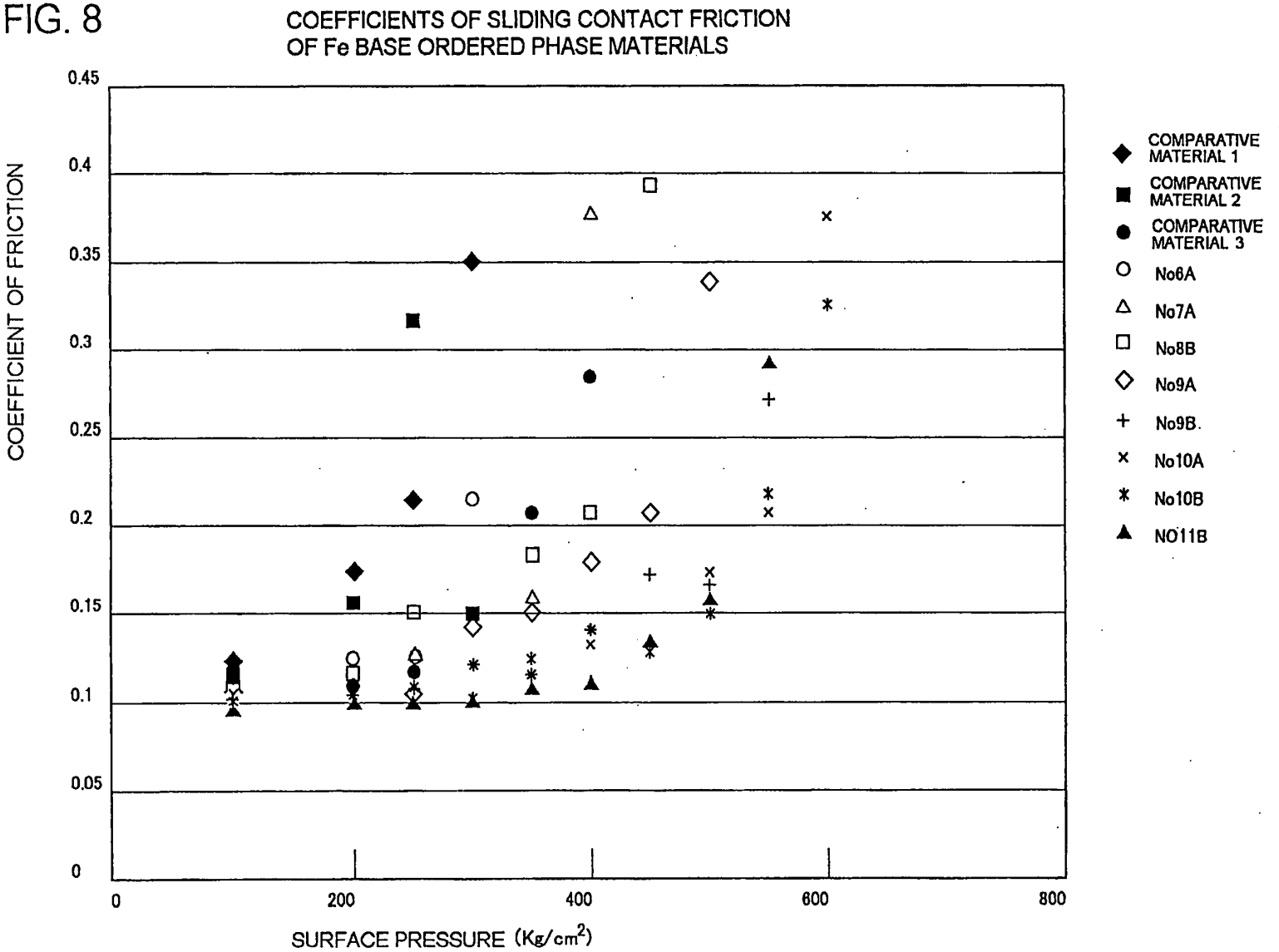

COEFFICIENTS OF SLIDING CONTACT FRICTION
OF Fe BASE ORDERED PHASE MATERIALS
COEFFICIENT OF FRICTION
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
200
400
600
800
SURFACE PRESSURE (Kg/cm2)
COMPARATIVE MATERIAL 1
COMPARATIVE MATERIAL 2
COMPARATIVE MATERIAL 3
No6A
No7A
No8B
No9A
No9B
No10A
No10B
NO11B

FIG. 9

SLIDING ABRASION AMOUNTS OF Fe BASE ORDERED PHASE MATERIALS

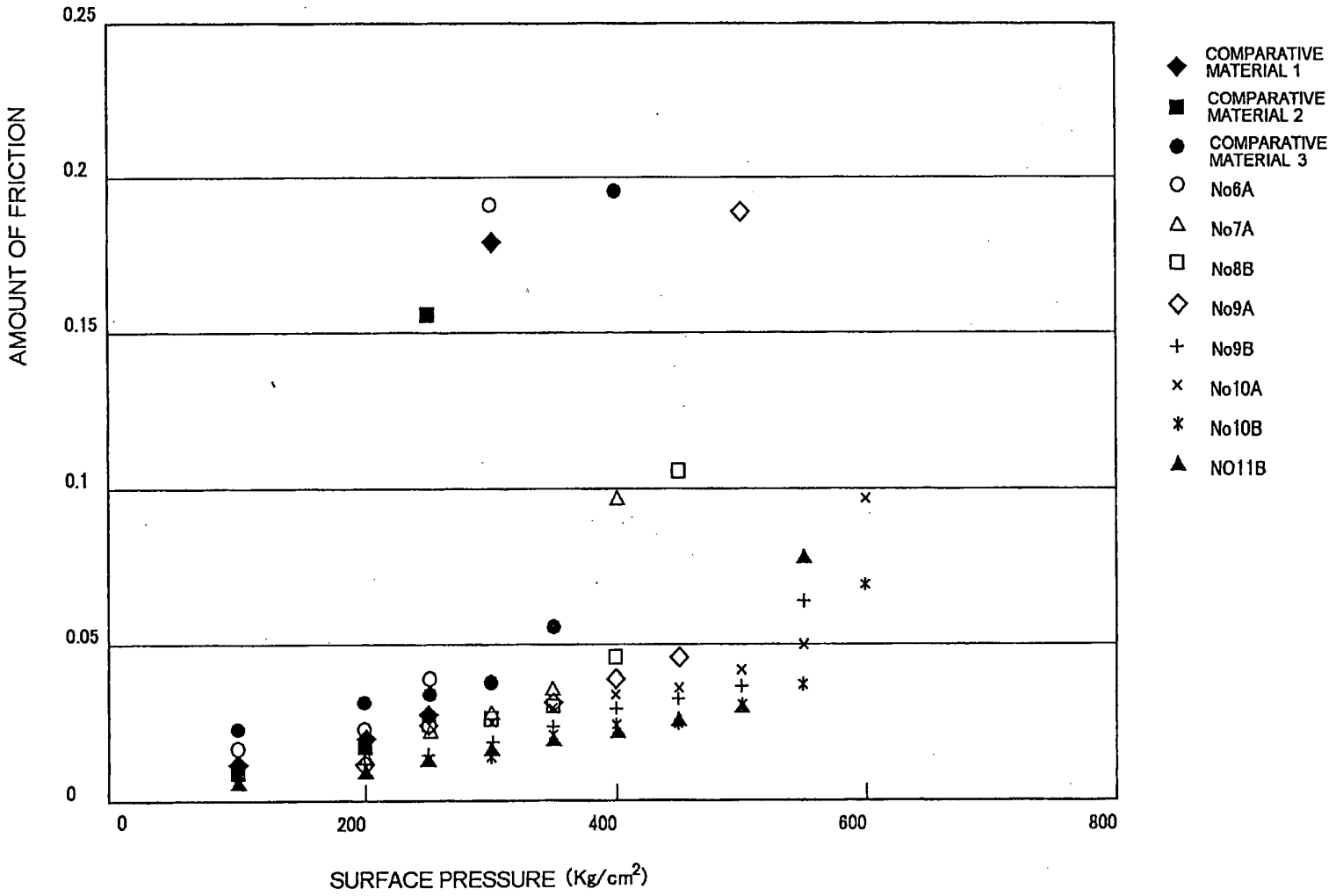


FIG. 10

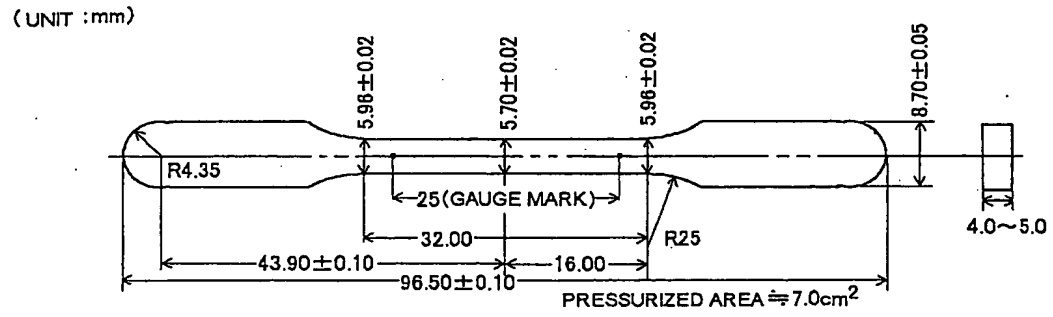

(UNIT :mm)
5.96±0.02
5.70±0.02
5.96±0.02
8.70±0.05
R4.35
25(GAUGE MARK)
32.00
R25
43.90±0.10
16.00
96.50±0.10
4.0~5.0
PRESSURIZED AREA ≒7.0cm2

FIG. 11

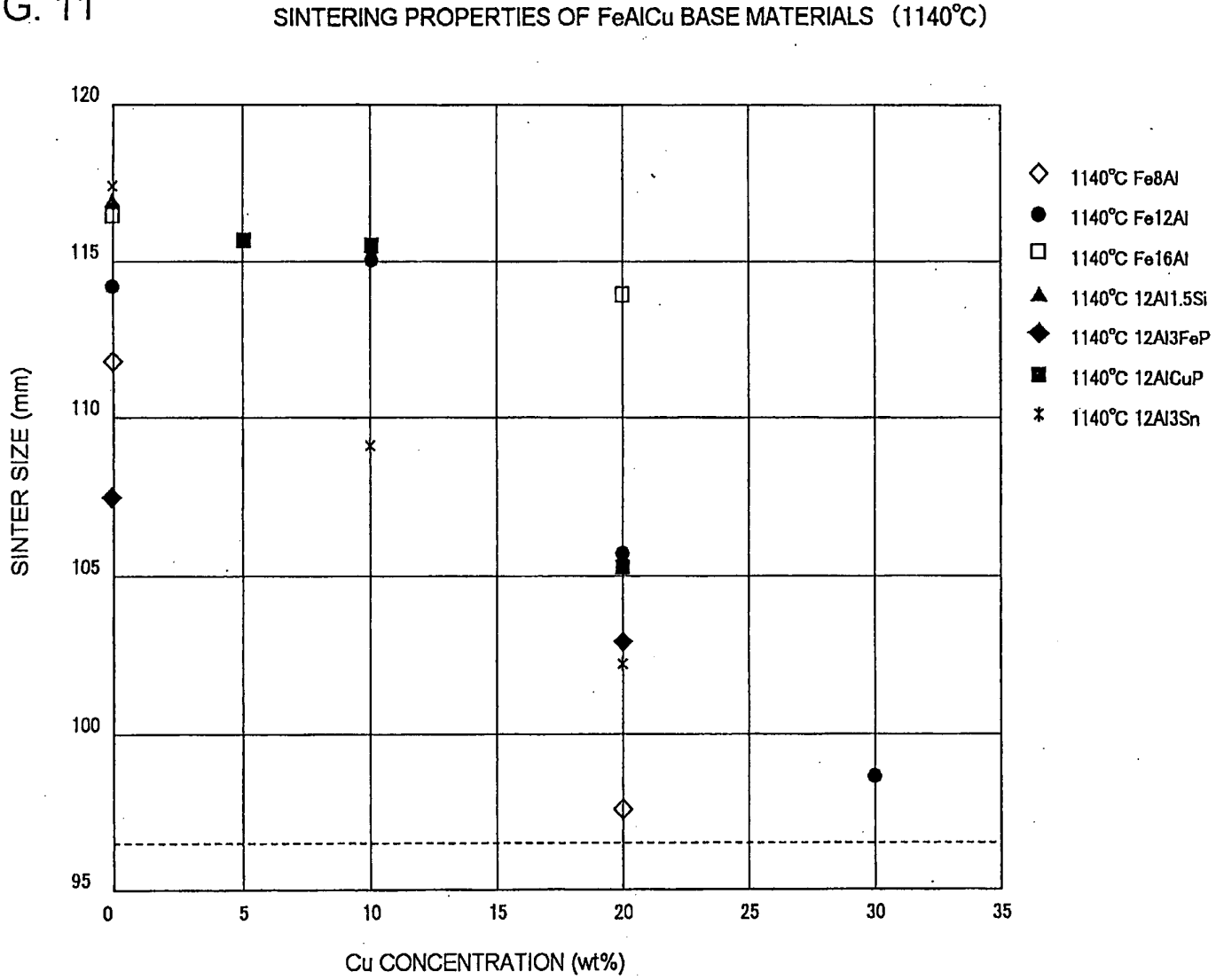

SINTERING PROPERTIES OF FeAlCu BASE MATERIALS (1140°C)
SINTER SIZE (mm)
120
115
110
105
100
95
0
5
10
15
20
25
30
35
Cu CONCENTRATION (wt%)
1140°C Fe8Al
1140°C Fe12Al
1140°C Fe16Al
1140°C 12Al1.5Si
1140°C 12Al3FeP
1140°C 12AlCuP
1140°C 12Al3Sn

FIG. 12

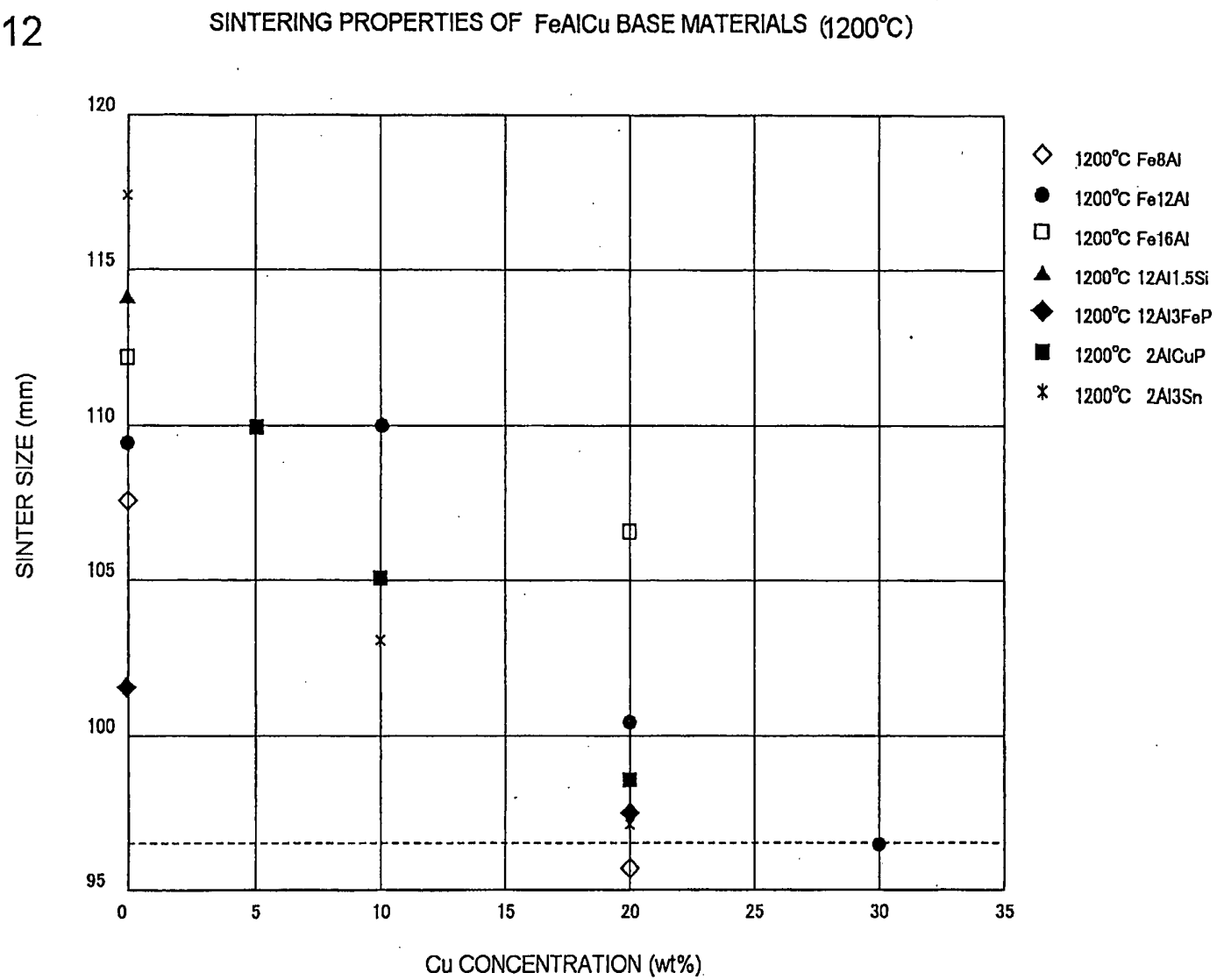

SINTERING PROPERTIES OF FeAlCu BASE MATERIALS (1200℃)
SINTER SIZE (mm)
120
115
110
105
100
95
0
5
10
15
20
25
30
35
Cu CONCENTRATION (wt%)
1200℃ Fe8Al
1200℃ Fe12Al
1200℃ Fe16Al
1200℃ 12Al1.5Si
1200℃ 12Al3FeP
1200℃ 2AlCuP
1200℃ 2Al3Sn

FIG. 13

SINTERING PROPERTIES OF FeAlCu BASE MATERIALS (1250°C)

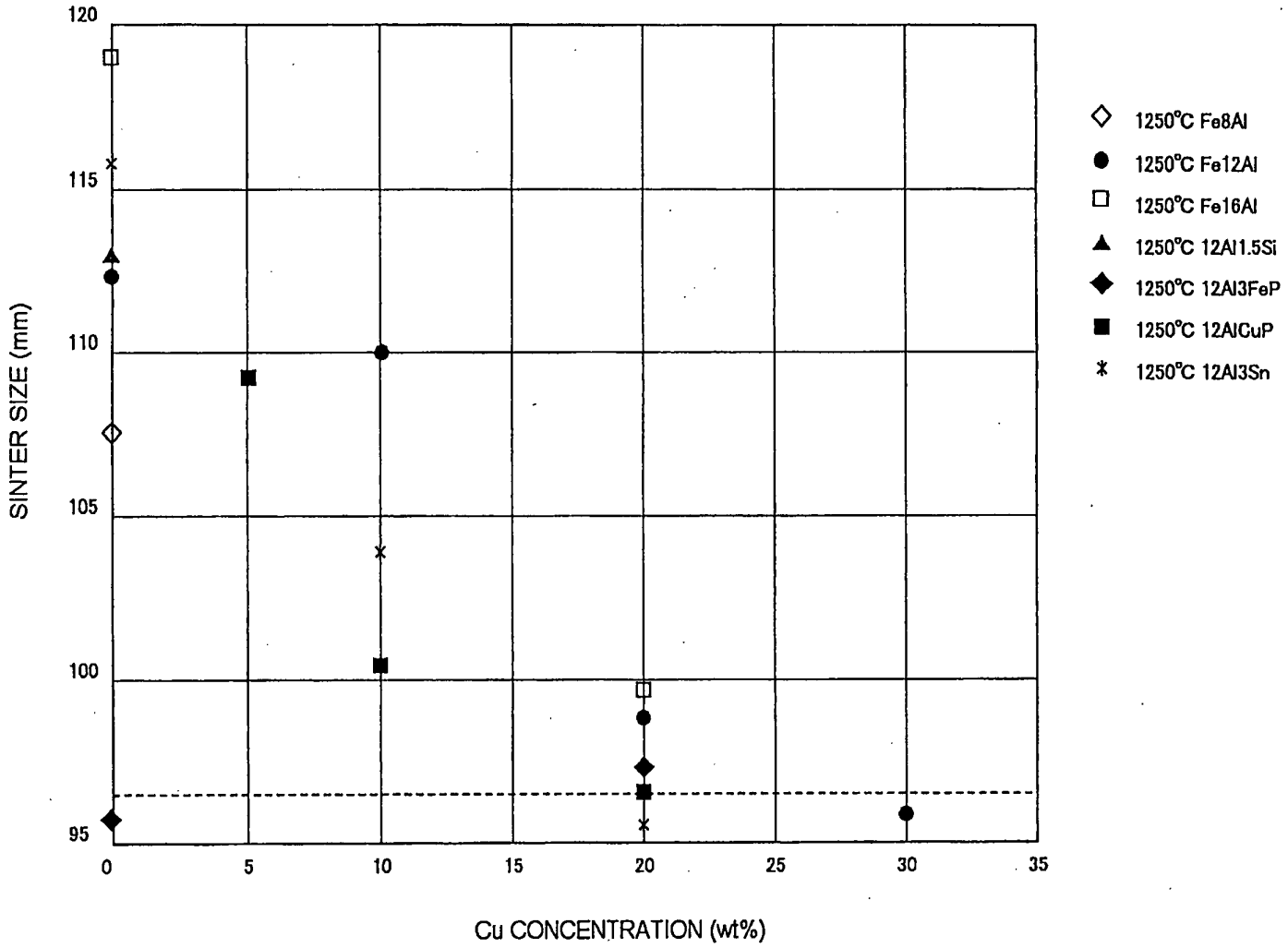
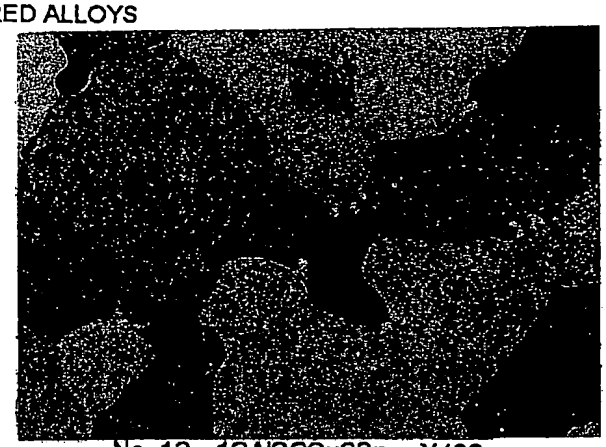
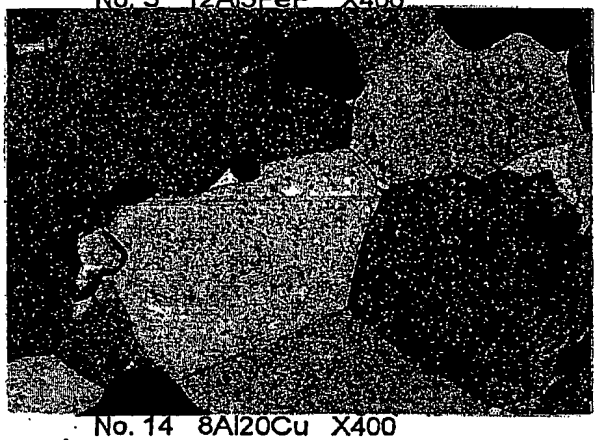


FIG. 14 SINTERED STRUCTURES OF VARIOUS Fe ORDERED PHASE SINTERED ALLOYS

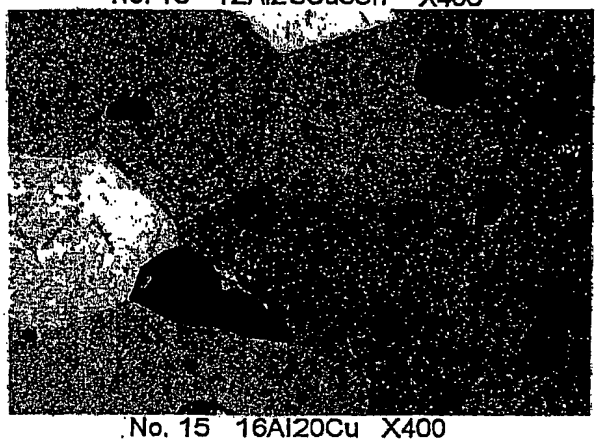
No. 5 12Al3FeP X400



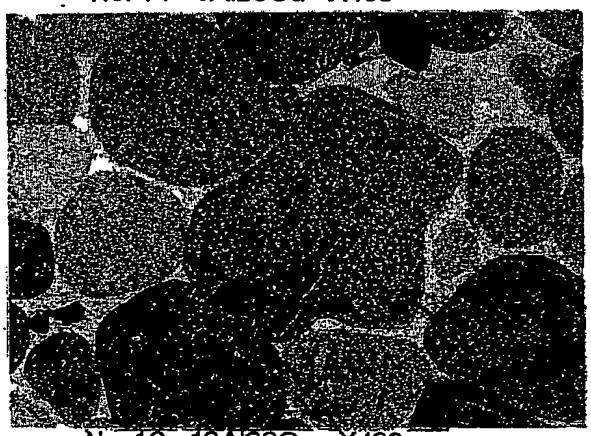
No. 13 12Al20Cu3Sn X400



No. 14 8Al20Cu X400



No. 15 16Al20Cu X400



No. 16 12Al30Cu X400

FIG. 15 EFFECTS OF Si, Ni, Co, FeAl ALLOYS UPON SINTER-CONTRACTIBILITY

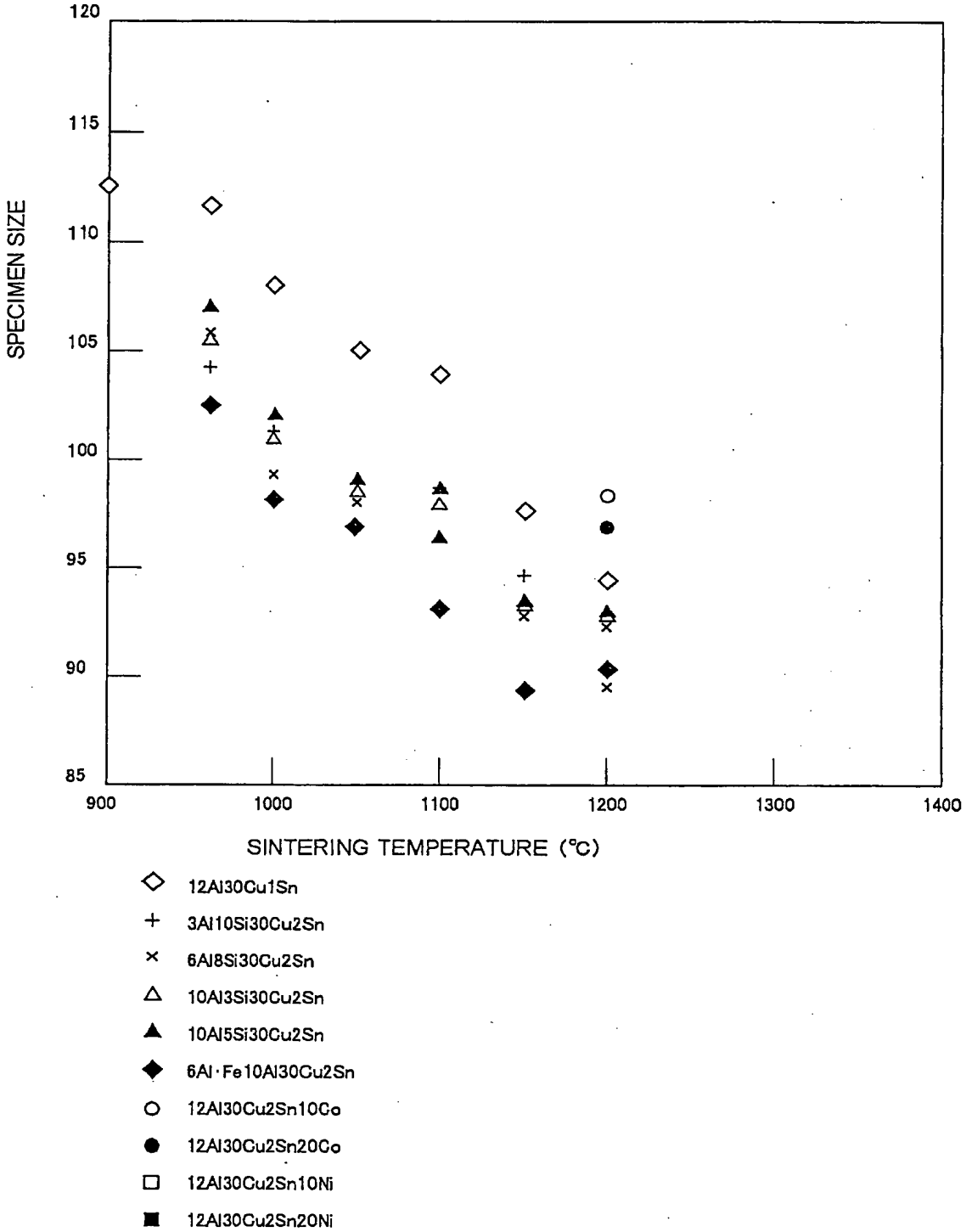
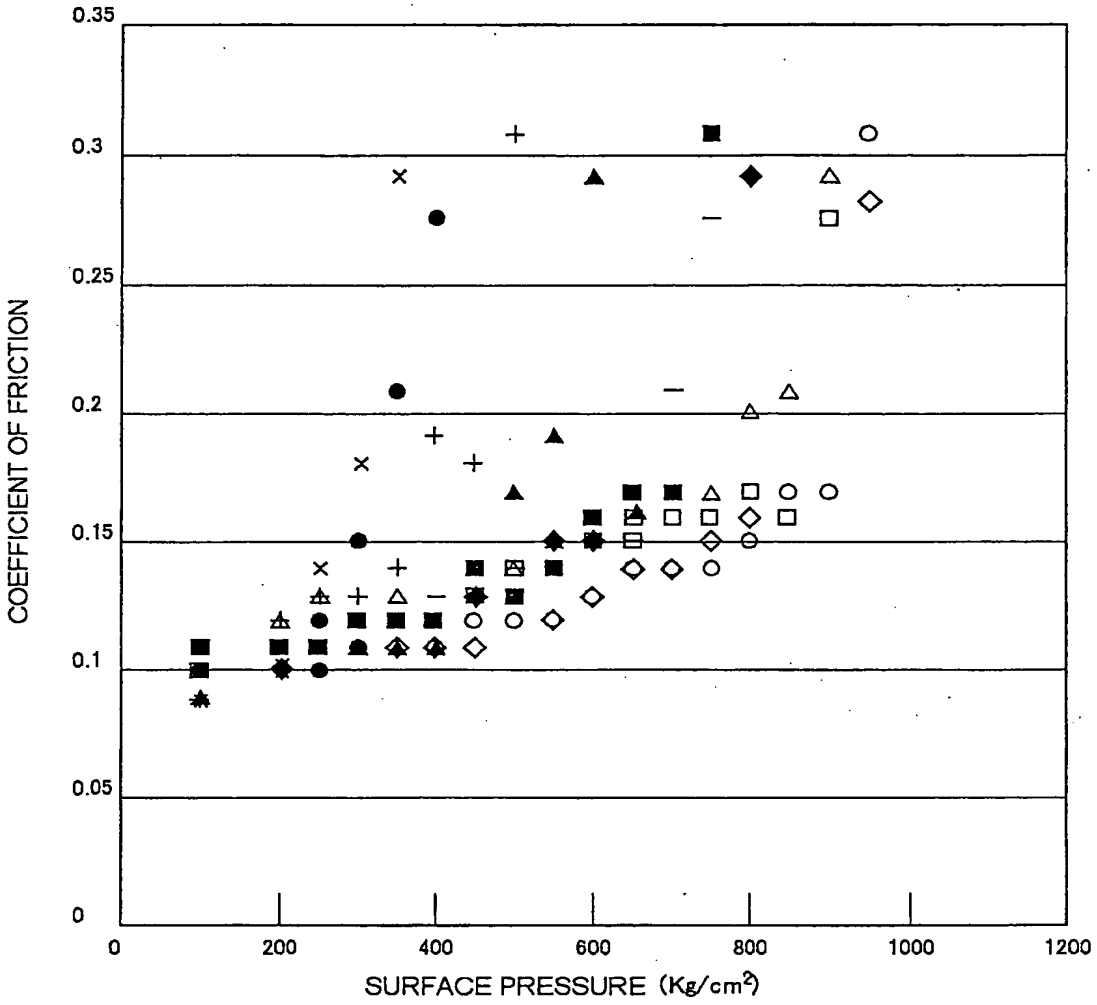


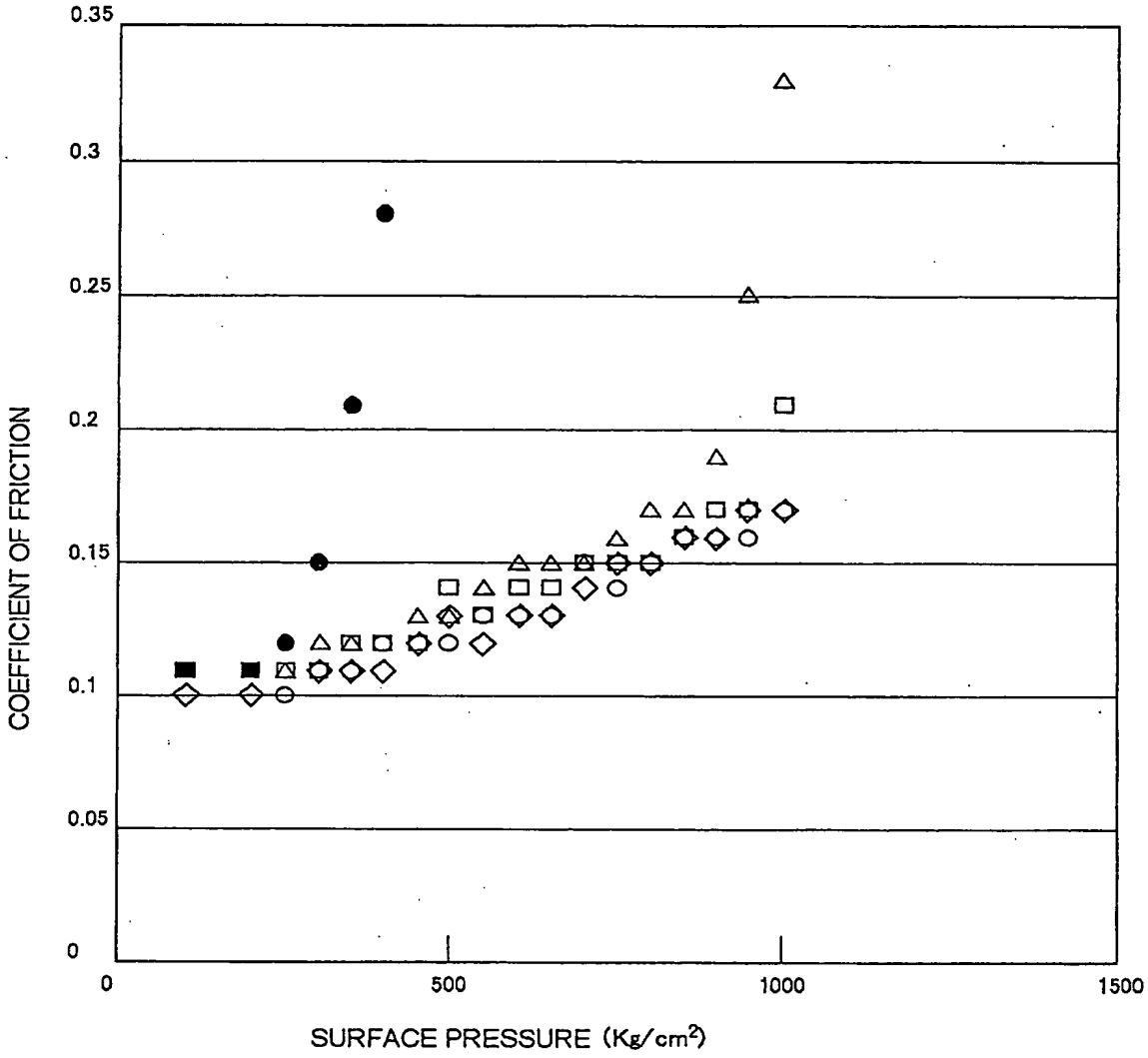
FIG. 16

SEIZURE RESISTANCE OF Fe BASE ORDERED PHASE SINTERED ALLOYS (POROSITY = ABOUT 10% VOLUME)



- ● HIGH STRENGTH BRASS QUARTERNARY MATERIAL: COMPARATIVE MATERIAL 3
- △ No5 12Al3FeP
- □ No20 12Al30Cu
- ◇ No29 12Al30Cu10Co
- ○ No31 12Al30Cu10Ni
- × No43 5FeAl
- \+ No44 10FeAl
- — No45 20FeAl
- ■ No46 30FeAl
- ▲ No47 10FeAlCo
- ◆ No48 20FeAlCo

FIG. 17 SEIZURE RESISTANCE OF Fe BASE ORDERED PHASE SINTERED ALLOYS (POROSITY = ABOUT 20% VOLUME)



● HIGH STRENGTH BRASS QUARTERNARY MATERIAL: COMPARATIVE MATERIAL 3

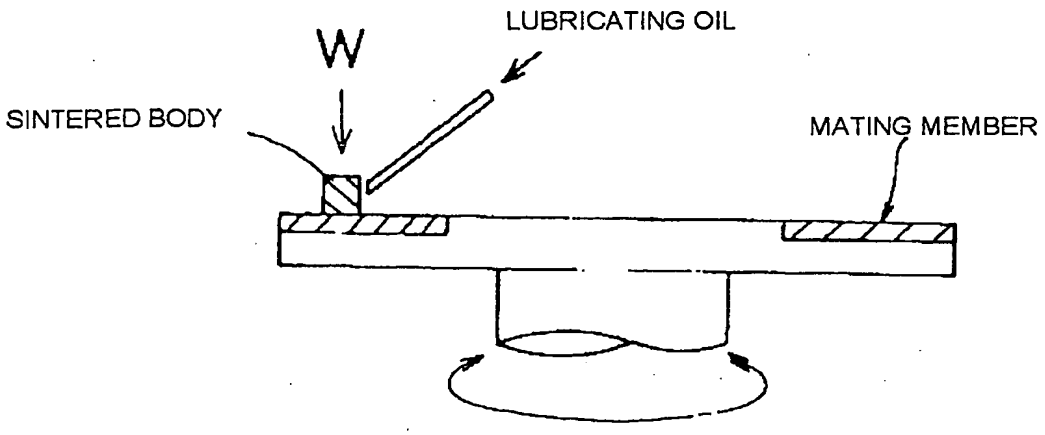
△ No5 12Al3FeP

□ No20 12Al30Cu

◇ No29 12Al30Cu10Co

○ No31 12Al30Cu10Ni

FIG. 18



TEST CONDITIONS

MATING MEMBER: CARBURIZED AND QUENCHED SCM 420

SURFACE HARDNESS: H_{RC} 60～62

SURFACE COARSENESS: 2.55 OR LESS

LUBRICATING OIL: E001, AMOUNT OF OIL: 250cm^3 /min.

OIL TEMPERATURE: 60℃

CIRCUMEFERENTIAL SPEED: 10m/sec.

SURFACE PRESSURE: max 800kg/cm^2

(50kg/cm^2 for each time)

FIG. 19

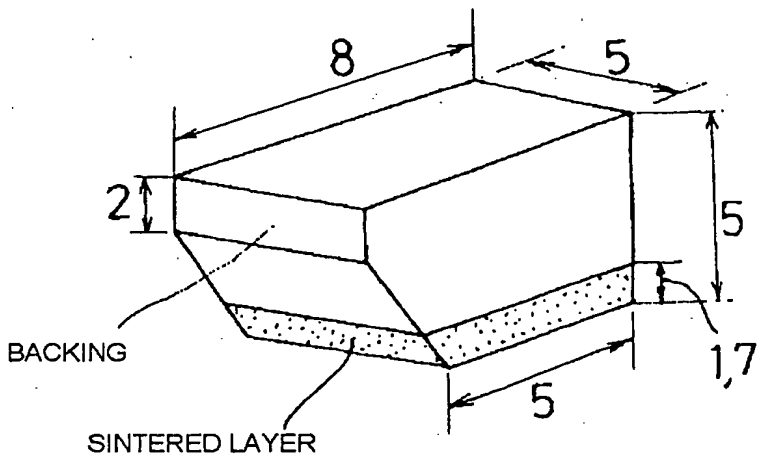
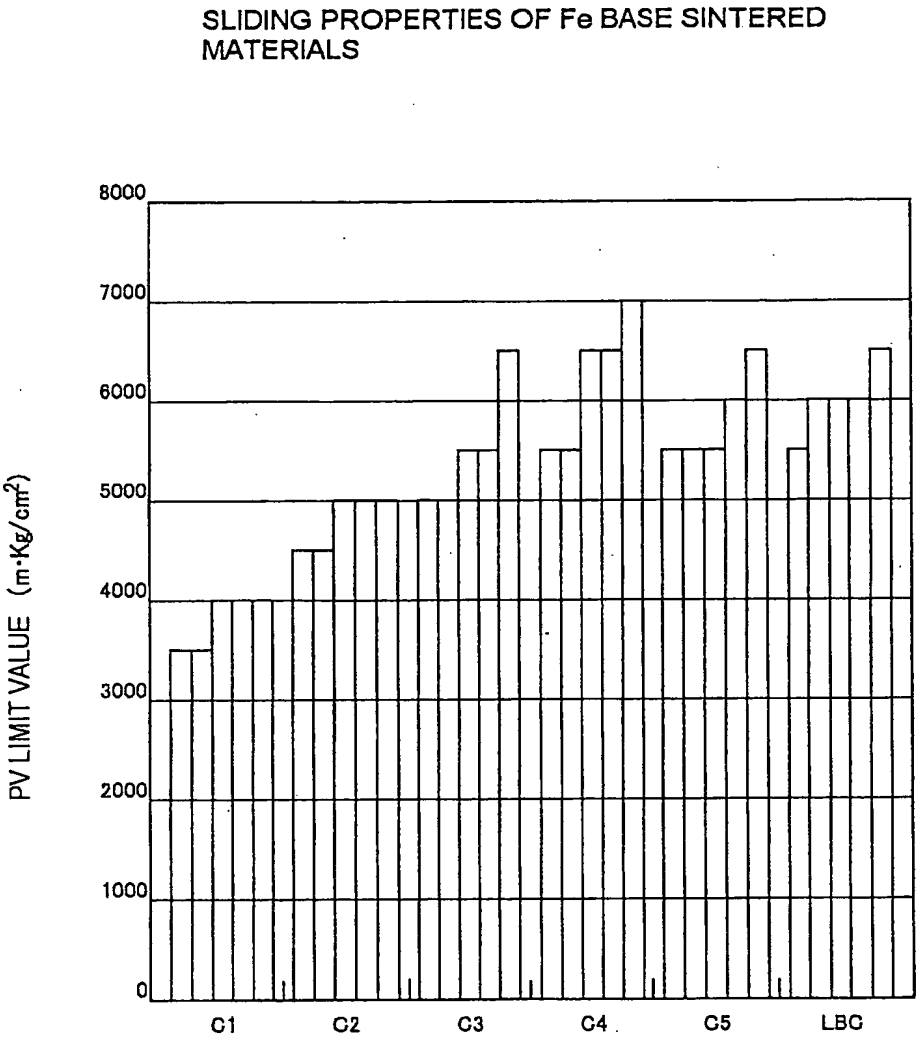


FIG. 20


SLIDING PROPERTIES OF Fe BASE SINTERED MATERIALS
PV LIMIT VALUE (m·Kg/cm²)
8000
7000
6000
5000
4000
3000
2000
1000
0
C1
C2
C3
C4
C5
LBC